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SELECTED ABSTRACTS
ON
TRADITIONAL FERMENTED FOOD

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ON
TRADITIONAL FERMENTED FOOD

Compiled by

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Preface

PDIN - LIPI (National Scientific Documentation Centre - Indonesian Institute of Sciences) is very pleased to present herewith Selected Abstracts on Traditional Fermented Food.

We are aware of the many short comings which the Abstracts contain, but, we still hopes, however, that this issue will help those working on traditional fermented food in tracing existing sources of information covering this subject.

Our cencere appreciation is expressed for the financial assistance which PDIN - LIPI received from the National Institute of Chemistry - LIPI, the Indonesian Protein Project in the framework of ASEAN - Australian Economic Co-operation.

Director, PDIN - LIPI

Fermenting mash, which produced many black spots, tended to produce a dark-brown sake cake. When dil. EtOH was added to the fermenting mash to extend the vol. and the acidity was lowered by diln., a dark-brown sake cake occurred. Supplementation with acids, such as HCl, lactic, or succinic acid, helped prevent the dark coloration. The addn. of $K_2S_2O_4$ was the most simple and effective method of preventing dark coloration.

CA, V. 51, 1957: 17082i

NAKAMURA, K.

Aluminum chloride as the preservative for sake. (Tax Admin.Agency, Tokyo). Nippon Jozo Kyokai Zasshi 1956, 51, 786-90; cf. C.A. 49, 15160i.

$AlCl_3$ (0.015-0.025%) inhibited the growth of Lactobacillus hyochi, a bacterium causing the putrefaction of sake called "Hiochi"; salicylic acid had only weak inhibitive activity and gave no increased effect when added to $AlCl_3$. The addn. of $AlCl_3$ also improved the quality of sake.
CA, V. 51, 1957: 17082a

NISSHIN SANGYO K.K.

Increasing the volatile aromatics of alcoholic beverages. (Mano, Fumiyoshi) Fr. 1,522,186 (Cl. C 12gc), 19 Apr 1968, Japan. Appl. 15 Oct 1966; 4 pp.

The volatile aromatics contained in the fermentation gas are condensed at 30° to − 60° or dissolved in solvents that can be added to the beverage. Thus, CO_2 contg. volatile aromatics from 5000 l. fermenting sake was absorbed in 80% EtOh at 5°, which was added to the sake before bottling.
CA, V. 71, 1969: 2140k

SAITO, T.; SAITO, K. ; et al.

Minor mineral components in sake and their effects on the sake quality. (Tokyo Tax Adm. Bur., Tokyo, Japan). Nippon Jozo Kyokai Zasshi 1972, 67(10), 881-5 (Japan).

The amts. of Fe, Cu, Mn, and Zn in sake were detd. with an at. absorption spectrophotometer on 92 samples. Cu and Fe were widely distributed among various sakes but Mn and Zn were not. Distribution patterns of Fe, Mn, and Zn were the same all over the country, but that of Cu varied with the district in which the sake was produced. Mineral contents had some correlations with other sake components of qualities. The main significant correlations (1% level) were found in the following combinations; Mn and acidity, Mn and amino acids, Zn and amino acids, Mn and Zn.
CA, V. 78, 1973: 70170q

SASAKI, S.; ITO, Y.; et al.

Iron in sake. I. Fate of bivalent and trivalent iron added to sake. (Tax Admin. Bur., Nagoya, Japan). Nippon Jozo Kyokai Zasshi 1965, 60(7), 628-31 (Japan).

In order to study the relation between Fe and color development of sake, changes of Fe(II) and Fe(III) added to sake were estd. The

sake contg. > 2 ppm. Fe rapidly darkened during storage at 20° for 3-15 days. The sake with Fe^{++} added colored more deeply than the one with an equal amt. of Fe^{3+} added. Fe^{++} was rapidly oxidized to Fe^{3+} in sake. Direct colorimetric detn. of Fe with α,α'-bipyridyl gave only 50-85% of Fe added, indicating that a certain portion of Fe was firmly bound with other components in sake and could not be set free by heating at 60° and pH 4.5 for 20 min. It was suggested that the coloration was not only catalyzed by Fe itself, but also promoted by the increase in redox potential caused by the oxidn. of Fe^{++} to Fe^{3+}.
CA, V. 64, 1966: 11819d

SATO, M.; NAKAMURA, K.; et al.
Quality deterioration prevention of sake. (Tax Administration Agency) Japan. 72 41,040 (Cl. C 12g), 17 Oct 1972, Appl. 68 83,794, 18 Nov 1968; 4 pp.

Addn. of 50-100 ppm caffeic acid to Japanese sake prevented coloring, change in flavor, and quality deterioration. Deferriferrichrysin may be added at 100 ppm, together with caffeic acid.
CA, V. 78, 1973: 27928f

SATO, N.; NAKAMURA, G.; et al.
Prevention of coloration of sake. (Japan, Bureau of Taxes) Japan. 70 25,277 (Cl. 36 B 152), 21 Aug 1970, Appl. 05 Sep 1967; 4 pp.

Sake is treated with H_2O_2 and then active C to remove $Fe(CN)_6^{3-}$-reducing substances. Thus, sake is mixed with 0.03 wt. % H_2O_2, stored 1 hr, contacted for 1 hr with 0.2 wt. % active C, and filtered. The treated sake shows an absorbance at 420 nm of 0.048 after 1 month storage, as compared with 0.083 for the original sake.
CA, V. 74, 1971: 63191m

SATO, S.; IWANAGA, T.; et al.
Colorants in sake. VI. The source of ferrichrome compounds and deferriferrichrome compounds in sake. (Res. Inst. Brew., Tax Admin. Agency, Tokyo, Japan). Nippon Jozo Kyokai Zasshi 1967, 62(12), 1393-6 (Japan).

Steamed rice and sake yeast (Saccharomyces cerevisiae Kyokai 7) did not contain ferrichrome (I) compds. and Fe-free I. The major pigments in yeast were composed of riboflavine (II), FMN, and FAD. Sake yeast contained total II of 9.0-10.5 γ/g. dry cell; the content fluctuated with the method of extn. The I and Fe-free I compds. were produced by Aspergillus flavus oryzae on steamed rice during koji-making. A koji prepd. with pure culture of the strain contained I 0.86, and Fe-free I 34.2 ppm. The koji was extd. with Me_2CO, and the ext. was fractionated by silica gel chromatog. to identify the presence of ferrichrysin (III) and Fe-free III. Thus, III and its Fe-free form were the main components among I compds. in sake and the main part of III in koji was in the Fe-free form.
CA, V. 68, 1968: 67722j

SATO, S.; NAKAMURA, K.; et al.

Colorants in sake. VIII. Color development of sake by various treatments. (Res. Inst. Brew., Tax Admin. Agency, Tokyo, Japan). Nippon Jozo Kyokai Zasshi 1968, 63(4), 457-60 (Japan); cf. CA 68: 67723k.

Changes of pigments in sake were studied by sepg. and detg. them by silica gel chromatog. Addn. of 2 ppm. Fe^{3+} to sake increased the amt. of ferrichrysin and other ferrichrome (I) compds. Exposure to sunlight or a photoreflector lamp increased the color. Irradn. caused Fe-free I compds. to decomp., but it enhanced the formation of melanoidin-like substances. Similar changes in color were observed in sake stored at 37° for 10 days. Light of wave-leng 280-380 mμ was most effective in color development of sake.
CA, V. 69, 1968: 105063a

SATO, S.; OBA, K.; et al.

Colorants in sake. V. A rapid method of determination for ferrichrome compounds and deferriferrichrome compounds in sake and rice koji. (Res. Inst. Brew., Tax Admin. Agency, Tokyo, Japan). Nippon Jozo Kyokai Zasshi 1967, 62(8) 875-80 (Japan).

A rapid method for detg. ferrichrome compds. (I) and Fe-free I (deferriferrichrome compds.) in sake and rice koji was presented. The I were detd. by measuring the decrease in absorbance at 430 mμ after 10 ml. of sample was heated with 1 ml. 1% EDTA at 60° for 30 min. The I contents were estd. from a calibration curve made with pure ferrichrysin. The Fe-free I was detd. by the increase in absorbance at 430 mμ after 10 ml. of sample was heated with 1 ml. 0.2 *M* citrate buffer (pH 4.0) and 1 ml. $FeCl_3$ soln. (contg. 100 ppm. Fe^{3+}) at 60° for 30 min. Under these conditions, the citrate prevented color development due to phenolic compds. and Fe^{3+}. The amt. of total I (including its Fe-free form) estd. by this rapid method coincided well with that obtained by silica gel chromatog. Contents of Fe-contg. I, Fe-free I, and total I in sake were, resp., 0-7, 0-24, and 2-30 ppm. Rice koji contained 0-80 mg. Fe-contg. I/kg. and 0-400 Fe-free I/kg.
CA, V. 68, 1968: 67721h

SATO, S.; TADENUMA, M.; et al.

Chelating ion-exchange resin treatment of sake for prevention from putrefaction by hiochi. (Res. Inst. Brew., Tokyo, Japan). Nippon Jozo Kyokai Zasshi 1971, 66(12), 1182-4 (Japan).

Sake was passed through a column of Dowex A-1 (H) at a specific velocity, and was protected from the invasion of hiochi bacteria for a long time. Mn, Mg, or Ca, which were required for the growth of the hiochi bacteria, were adsorbed strongly by Dowex A-1. Putrefaction of sake by hiochi bacteria was prevented by removal of the following minerals to less than the stated concns.: Mn, 0.1-0.2; Mg, 0.5-1.0; and Ca, 0.2-1.0 ppm.
CA, V. 76, 1972: 111666k

SAWAI, E.; TAKASE, S.; et al.

Iron in sake brewing. I. Transfer of iron from rice to sake and sake cake. (Hiroshima Tax Admin. Bur., Japan). Nippon Jozo Kyokai Zasshi 1962, 57(4), 317-24

Total Fe content in unpolished rice was 16.97 p.p.m. Which was decreased to about 50% by polishing the rice. About 40% of Fe in polished rice was further removed by wasing. Fe content in sake cake was about 70% of that in polished and washed rice. In 30 samples of sake tested. Total Fe content was 0.37-3.05 p.p.m. (av. 1.16 p.p.m.). It was found that 45% of Fe in sake was derived from rice, the remainder being derived from other source such as brewing water. The amt. of Fe which directly reacts with 2.2-bipyridine was about 40% of total fe in sake.
CA, v. 61, 1964: 6347a

SHIMADA, K.; SHIMAZU, Y.; et al.
Removal of salicylic acid in sake by means of lactate from anion-exchange resins. (Cent. Res. Lab., Kikkoman Shoyu Co. Ltd., Noda, Japan). Nippon Jozo Kyokai Zasshi 1970, 65(8), 709-12 (Japan).

Efficiency of the selective adsorption of salicylic acid, which had been added to sake to prevent infection by hiochi bacteria, was tested on Amberlite IRA-410, -400 and -411, Dowex-1, -2, and -21K chromatog. Amberlite IRA-410, neutralized to pH 6.0 with the lactate buffer soln., was most effective in removing salicylic acid. About 20 kl of sake contg. 250 ppm of salicylic acid was treated by 200 l of the resin at a specific flow rate of SV 6 (6 times as much as the vol. of resin/hr). Removal of salicylic acid from sake was nearly 99.8%. The treated sake did not change in flavor.
CA, V. 75, 1971: 150261y

SHIMODA, C.
An antibiotic substance, oryzacidin, against sake-putrefying bacteria, produced by Aspergillus oryzae. I. Isolation of oryzacidin. J. Agr. Chem. Soc. Japan 1951, 25, 254-60

A strain of A. oryzae produced an antibiotic, oryzacidin, against sake-putrefying bacteria. Cryst. oryzacidin showed activity against these bacteria in a diln of 1:300,000. Oryzacidin has formula $C_8H_{13}O_5N$, m. 162-3° (decompn.), white needles, hygroscopic, $(\alpha)_D^{13.5}$ -133°, sol. in H_2O, MeOH, EtOH, PrOH, and hot Me_2CO; difficulty sol. in BuOH, and AcOEt; insoln. in Et_2O, Me_2CO, $CHCl_3$, and CCl . It has no OH, CHO, CO groups but it has COOH. Its quinine salt, m. 210° (decompn.) was white tabular crystals, $C_8H_{13}O_5N(C_{20}H_{24}O_2N_2)$. $5H_2O$. Oryzacidin is different from aspergillic acid and flavicin formely isolated from A. flavus.
CA, V. 46, 1952: 10284h

SHIMODA, C.
Normal fermentation of sake for prevention of deterioration by microorganisms. Japan. 5294-('51), Sept. 15.

Saccharification of rice with Aspergillus oryzae A33 (I) and fermentation with yeast gives normal sake, as I produces an antibiotic substance effective against Clostridium sporogenes, etc. In Japan. 5297 ('51), synthetic sake is made by mixing rice saccharified with I, EtOH, succinic acid, lactic acid, an amino acid, etc.
CA, V. 47, 1953: P 2934e

TADENUMA, M.; SATO, S.

Studies on the colorants in sake. The presence of ferrichrysin as iron containing colorant in sake. (Tax Admin. Agency, Tokyo). Agr. Biol. Chem 1967, 31(12), 1482-9 (Eng).

One of the major colorants in sake was isolated in cryst. form and was identified as ferrichrysin. Ferrichrysin in sake was formed by Aspergillus oryzae. Iron-free ferrichrysin (deferriferrichrysin) was also present in sake.
CA, V. 68, 1968: 67707h

TADENUMA, M.; TAKAHASHI, K.; et al.

Manganese determination in sake. (Res. Inst. Brew., Tokyo, Japan). Nippon Jozo Kyokai Zasshi 1971, 66(4), 427-9 (Japan).

A sake sample is passed through the column of Dowex A-1 to remove Mn. The column is washed with H_2O and then Mn absorbed is eluted with N HCl. The eluate is dried over a porcelain dish adding HNO_3 and H_2SO_4, successively. The dried black matter is transferred into HNO_3 and insol. matter is removed by millipore filtration. To an aliquot of the filtrate, H_2SO_4 and H_3PO_4 are added sucessively. After addn. of KIO_3, it is heated at 100° for 30 min and then cooled rapidly. The absorbance of red color developed is measured at 530 mμ.
CA, V. 76, 1976: 97920e

TADENUMA, M.; YAO, T.; et al.

Colorants in sake. VII. Conditions of producing ferrichrome compounds and deferriferrichrome compounds in various media. (Res. Inst. Brew., Tax Admin. Agency, Tokyo, Japan). Nippon Jozo Kyokai Zasshi 1967, 62 (12), 1397-401 (Japan).

Aspergillus flavus oryzae did not produce ferrichrome (I) compds. and Fe-free I compds. in liq. or agar-plate culture, but produced them on steamed rice. Forty-one strains of Aspergillus were tested for their ability to produce I. A. terreus and A. tamarii produced mainly ferrichrysin or ferricrocin, and A. niger produced mainly I, on steamed rice. These compds. were present mainly in Fe-free form.
CA, V. 68, 1968: 67723k

TAGUCHI, H.; HOSOMI, M.; et al.

Application of antibiotics to fermentation industry. I. Actions of antibiotics on the bacteria grown in "karashimoto" of sake brewing. (Univ. Osaka). Hakko Kogaku Zasshi 1959, 37, 138-42.

Greater parts of bacteria isolated from "karashi-moto," a starter, were inhibited in their growth by penicillin, aureomycin, streptomycin, fradiomycin, polymyxin, bacitracin, ferromycin, and azomycin. Aureomycin, streptomycin, and fradiomycin were most active and showed inhibition in 1-2 γ/ml. Penicillin was more active on gram-pos. bacteria. Bacitracin and azomycin could not inhibit some bacteria in 50 γ/ml. or more. Directly applied during sake brewing, these antibiotics did not influence the quality or yield of sake. Streptomycin and aureomycin were recommended to prevent putrefaction of "karashi-moto" in sake brewing.

II. The use of antibiotics in alcohol fermentation. Ibid. 142-5.

Detd. the min. inhibition concns. of the above antibiotics against the bacteria isolated from the alc. mashes in amylo-shubo, submerged fungal methods, and in an open fermenter system. Penicillin, aureomycin, fermromycin, and polymyxin were particularly active and sufficiently inhibitive at concns. of 1-5 γ/ml. Application of these antibiotics can prevent the decrease of the yield of alc. by fermentation due to bacterial contamination. One of the isolated, contaminated bacteria produced anti-yeast substance, which also was inhibited by the antibiotics.
CA, V. 54, 1960: 6023e

TAKAHASHI, M.; AKAI, T.; et al.
Sake brewing test with use of the rice grown in Hokkaido. IV. Minerals in the brown and milled rices. (Ind. Res. Inst. Hokkaido, Sapporo, Japan). Nippon Jozo Kyokai Zasshi 1972, 67(3), 237-41 (Japan).

Brown rice and milled rice harvested in 1970 were analyzed for their Fe, Mn, K, and Cu contents. Sample grains were ashed directly and analyzed for their mineral contents by at. absorption spectrophotometry. Av. contents of minerals in brown rice grown in Hokkaido were 14.3 ppm Fe, 33.4 ppm Mn, 2.9 ppm Cu, and 282.1 mg % K. Av. contents were 2.6 ppm Fe, 7.7 ppm Mn, 1.7 ppm Cu, and 48.4 mg % K in milled rice grown in Hokkaido. By washing, 40-50% Fe and 80-90% Mn were lost from milled rice but most of the Cu remained.
CA, V. 77, 1972: 150552k

TAKAHASHI, S.
Utilization of salicylic acid in sake brewing. (Saitama Brewing Guide Sta., Urawa). J. Soc. Brewing (Japan) 1953, 48, 422-5.

Salicylic acid accelerated fermentation and prevented putrefaction.
CA, V. 49, 1955: 5770e

TAKASE, S.; HYODO, S.; et al.
Iron in sake brewing. V. Changes in iron content during fermentation. (Tax Admin. Agency, Tokyo). Nippon Jozo Kyokai Zasshi 1965, 60(10), 903-7 (Japan); cf. CA 63, 15506gh.

Fermenting sake mash contained about 0.4 ppm. Fe. Fe in the liquid portion of the fermenting mash decreased to about 0.04 ppm. during the early stages and then increased after the middle stage of fermentation to 0.1-0.11 ppm. The Fe in the liquid portion was 5-6% of the total Fe in the whole mash and about 20% of the total at the last stage of fermentation. Fe content was somewhat increased by treatments after fermentation (e.g., filtration, sediment sepn.), indicating contamination from the app. Filtration of sake through active C did not affect Fe content.
CA, V. 64, 1966: 10363e

TAKASE, S.; MURAKAMI, H.
Fluorescence of sake. I. Fluorescence spectrum of sake and identification of harman. (Res. Inst. Brewing, Tax Admin. Agency, Tokyo). Agr. Biol. Chem. (Tokyo) 1966, 30(9), 869-76.

Two fluorescent compds., ferulic acid (Yamamoto, et al., Nippon Nogei-Kagaku Kaishi 1961, 35, 715) and harman, were identified in sake. Sake

(10 l.) was extd. with Et_2O. The concd. ext. was chromatographed on paper using BuOH satd. with water. Ferulic acid and harman (3 and 15 mg, resp.) gave R_f values of 0.35 and 0.66, resp.
CA, V. 66, 1967: 9943b

TAKASE, S.; MURAKAMI, H.; et al.
Fluorescence of sake. V. Origin of YS substances [yellow-green fluorescent compounds] and other fluorescent substances in sake. (Res. Inst. Brew., Tax Admin. Agency, Tokyo, Japan). Nippon Jozo Kyokai Zasshi 1968, 63(8), 881-8 (Japan).

In order to clarify the formation mechanism of the yellow-green substance (YS) in sake, mixed solns. of sake and tryptophan (I), or glucose (II) and I were heated, and their Et_2O sol. basic fractions were fractionated by cellulose column and thin layer chromatog. Mixed solns. contg. II and various amino acids or a single soln. of each amino acid were also heated, and fractionated in a similar way. YS was formed from I and II, and substances with the strongest fluorescence were obtained from I, histidine, and phenylalanine, among various amino acids. YS was compared with known degradation products from I but none of them was identical with YS. Similarity between YS and indigo white in their structure was pointed out. Another new phenolic and strongly blue fluorescent substance was found in the AcOEt soln. from aged sake or sake exposed to sunlight.
CA, V. 69, 1968: 75586d

TAKASE, S.; SAHARA, T.; et al.
Iron in sake brewing. II. Iron content in rice, brewing water, sake, and sake cake. (Tax Admin. Bur., Hiroshima, Japan). Nippon Jozo Kyokai Zasshi 1963, 58(4), 1068-93 (Japan); cf. CA 61, 6347a.

Unpolished rice contained 8-11 ppm. Fe, which was decreased to 0.5-1.0 ppm. by polishing. The Fe content of the sake usually added with EtOH was 0.03-0.63 ppm., and sake cake contained 4-16 ppm. Fe on a dry-matter basis. There were pos. correlations between the Fe content in brewing H_2O and that in sake and between the Fe in sake and the color of fresh sake.

III. Quantitative transition of iron in sake brewing. Ibid. 1964, 59(8), 722-4.

Av. Fe contents were brewing H_2O 0.042, sake 0.30, polished rice 1.14, steamed rice 1.46, koji 1.66, and sake cake 5.7 ppm. (on dry-matter basis except for the 1st 2). It is suggested that Fe is absorbed by rice from H_2O used in washing or steeping rice, and that Fe in rice is transferred mainly into sake cake.

IV. Adsorption of iron in steeping water on rice grains. Ibid. 1965, 60 (7), 624-7.

Fe in the steeping water was adsorbed on rice grains, the adsorption being most marked at pH 3.5-4.5. The adsorption occurred even from tap water contg. 0.057 ppm. Fe. Ca^{++} and K^+ did not affect Fe adsorption even when present in 100 times the concn. of that of Fe, while Al^{3+} inhibits Fe adsorption to some extent. EDTA decreased the amt. of Fe ad-

sorbed, but polyphosphates had no effect. The Fe once adsorbed on rice was not eluted with distd. H_2O but was eluted with 30 ppm. EDTA soln.
CA, V. 63, 1965: 15506g

TAKASE, S.; SAKAI, T.; et al.
Fluorescence of sake. III. Distribution of harman among various kinds of brewing products and influence of harman on the growth of microbes. (Res. Inst. Brew., Tax Admin. Agency, Tokyo, Japan). Nippon Jozo Kyokai Zasshi 1967, 62(12), 1415-22 (Japan).

Harman (I) content was about 1.1 ppb. in young sake before pasteurization, and increased to 340 ppb. after storage for 3 years. I was also present in soy sauce, 120 ppb.; miso, $\sim$5.8 ppb.; and beer, wine, and mirin, <2.2 ppd. I inhibited the growth of molds (Aspergillus), yeasts, and lactic acid bacteria, but stimulated the growth of Lactobacillus homohiochi, and L. heterohiochi. In every case, the effective concn. of I was 0.02-0.08% in synthetic medium.
CA, V. 68, 1968: 67724m

TAKASE, S.; SAKAI, T.; et al.
Fluorescence of sake. IV. A new yellow-green fluorescent substance, YS, in sake. (Res. Inst. Brew., Tax Admin. Agency, Tokyo, Japan). Nippon Jozo Kyokai Zasshi 1968, 63(7), 783-8 (Japan); cf. CA 68, 67724m.

A new fluorescent substance designated YS (I) with yellowish green fluorescence was found in sake and other beverages. Its content was increased by heating sake with tryptophan, and the I was sepd. from sake (10 l.) heated with 5 g. tryptophan in an autoclave for 1 hr. The treated sake was made alk., and extd. with Et_2O; the ext. was concd. and extd. with 1 N HCl. A reddish ppt. formed on neutralizing the acidic ext. was subjected to thin layer chromatog. with $CHCl_3$-AcOEt-EtOH (30:19:1). The substance showing an R_f of 0.30 was collected and extd. with $CHCl_3$; the $CHCl_3$ soln. was concd. to ppt. crude I, which was recrystd. from 1 N HCl, and then from hot C_6H_6 (yield 56 mg.). The I was yellowish plates, m. 183°, and gave bluish green and blue fluorescence under wet and dry conditions, resp., a pos. Dragendorff reaction, and a neg. ninhydrin reaction. A mol. formula $C_{16}H_{14}N_2O_3$ was presented for I, and it was suggested to be a heterocyclic compd. contg. N from ir spectral data.
CA, V. 69, 1968: 75559x

TATOKORO, Y.
The uv absorbancy of sake. (Ibaraki Prefect. Food Res. Inst., Mito, Japan). Ibaraki-Ken Shokuhin Shikensho Hokoku 1972, (16), 29-42 (Japan).

Absorption at 270 mμ was used for an estn. of the aging of sake. Sake was concd. in vacuo, deproteinized, and passed through an Amberlite IR-120(Cl^-) column before being subjected to absorption spectrog. The absorption was attributable to unidentified substances which are not amino acids, sugars, or org. acids.
CA, V. 81, 1974: 76380s

TATOKORO, Y.
Iron content of water for brewing sake in Ibaraki prefecture. (Ibaraki Prefect. Food Res. Inst., Mito, Japan). Ibaraki-Ken Shokuhin Shikensho Hokoku 1972, (16), 43-57 (Japan).

Water contg. <0.03 ppm. Fe is desirable for sake brewing. Of 515 samples, 276 contained <0.03 ppm. Fe. Sake made from water contg. 0.012, 0.042, 0.100, and 0.150 ppm. Fe contained 0.150, 0.250, 0.435, and 0.460 ppm. Fe, resp.
CA, V. 81, 1974: 76433m

TOTSUKA, A.; NAMBA, Y.; et al.
Determination of iron, manganese, zinc, and copper in sake. (Res. Inst. Brew., Tokyo, Japan). Nippon Jozo Kyokai Zasshi 1970, 65 (12), 1116-9 (Japan).

Detn. of Fe, Mn, Zn, and Cu in sake was carried out by at. absorption spectrophotometry. From super refined sake (Ginjo), 29 samples in high rank and 20 samples in low rank were taken and their mineral contents were estd. Mean values were 0.055 (high rank) and 0.064 (low rank) for Fe, 1.551 (high rank) and 1.727 (low rank) for Mn, 0.573 (high rank) and 0.570 (low rank) for Zn, and 0.039 (high rank) and 0.062 ppm (low rank) for Cu. Minerals were also detd. in special class, 1st class, and 2nd class samples taken from 10 breweries. Fe contents were 0.084 ± 0.044 in special class, 0.117 ± 0.044 in 1st class, and 0.132±0.04 ppm. in 2nd class. Mn contents were 1.752 ± 0.139 in special class, 1.635 ± 0.139 in 1st class, and 1.469 ± 0.139 ppm. in 2nd class. Zn contents were 1.375 ± 0.184 in special class, 1.458 ± 0.184 in 1st class, and 1.718 ± 0.184 ppm. in 2nd class. Significant differences were found between breweries and between classes. Cu contents were 0.134 ± 0.058 in special class, 0.139 ± 0.058 in 1st class, and 0.153 ± 0.058 ppm. in 2nd class.
CA, V. 75, 1971: 150259d

TOTSUKA, A.; NAMBA, Y.
Analysis of minerals in water and sake by a UHF [ultrahigh frequency] Plasma Spectra Scan. (Res. Inst. Brew., Tokyo, Japan). Nippon Jozo Kyokai Zasshi 1972, 67(4), 373-5 (Japan).

Al, As, B, Ca, Cd, Co, Cr, Cu, Fe, Ge, Hg, K, Mg, Mn, Na, Ni, Pb, Si, Sn, and Zn were analyzed in a sake made with deionized water by a UHF Plasma Spectra Scan (Hitachi, Type 300). All of the minerals, except As, were found in the sake. Besides the above mentioned minerals, Li, Mg, and Si were also detd. in several brewing waters. Cd, Hg, and Ge were also detected in brewing water for the first time.
CA, V. 77, 1972. 150551j

UENO, R.
Preservation of sake. Japan. 72 48,679 (Cl. C 12h), 07 Dec 1972, Appl. 64 73,044, 23 Dec 1964; 6 pp.

A preservation method for sake was developed by addn. of heptyl or octyl p-hydroxybenzoate, or a mixt. thereof, to sake during or after prodn. as either alk. aq. solns., alc. solns. of the ester, or undissolved esters. For example, heptyl or octyl p-hydroxybenzoate-alc. soln. was added to sake (27γ/ml sake) followed by sterilization, cooling, and adjusting the alc. concn. to 16%. No degrdn. of sake quality was obsd. after 4 months storage, whereas sake without the ester putrefied after only 20 days storage.
CA, V. 79, 1973: 124714m

YAJIMA, M.; HITAKA, Y.; et al.
Antiseptic treatment of Japanese sake. (Eisai Co., Ltd.) Japan. 71 03, 115 (Cl. C 12g), 26 Jan 1971, Appl. 28 Mar 1967; 5 pp.

Lysozyme (EC 3.2.1.17) or its salts are added to sake. Thus, a sake (72 mg. lysozyme chloride/1.8 l.) bottled after 5 min at 60° shows no taste change after 1 year of storage at room temp.
CA, V. 75 1971: 128509p

f. Storage

ADACHI, Y.; KASHIWABARA, Y.
Preservation of sake by freezing. (Fukuju Sake Brewery Co., Ltd.) Japan. 73 18 832 (Cl. C 12h), 08 Jun 1973 Appl. 69 101 426, 17 Dec 1969; 1 pp.

Fresh sake was packed in a paper or vinyl container in a stream of CO_2, frozen, and stored in a cold room adjusted to <-20° and <50% relative humidity. The sake was transported in a frozen state. The sake was sold frozen or after thawing. Thus, putrefaction of sake was prevented and quality of sake was preserved.
CA, V. 79, 1973: 103650x

IWANO, K.
Relation between the rate of coloration and the chemical composition of sake during storage. (Natl. Res. Inst. Brew., Tokyo, Japan). Hakko Kogaku Zasshi 1974, 52(9), 662-8 (Japan).

Multiple regression analyses were used to obtain equations relating the rate consts. for 3-deoxyglucosone formation and coloration during sake maturation to chem. analyses of the sake. These rate consts. were used successfully in previously described equations to predict maturation and color increase in 20 samples of sake.
CA, V. 82, 1975: 15206p

IWANO, K.; KINUYAMA, Y.; et al.
Quality control of sake for shipment. III. Relation between 3-deoxyglucosone content and coloring of sake during the storage. (Kanazawa Tax Adm. Bur., Kanazawa, Japan). Nippon Jozo Kyokai Zasshi 1970, 65 (12), 1113-5 (Japan).

Adsorption of 3-deoxyglucosone (I) by active C was investigated using 16 kinds of com. available active carbons. None of them adsorbed I under ordinary usage. Sake samples differing in I content were decolorized by treatment with active C and their coloring under storage was checked. Good correlation (correlation coeff. 0.9909) was found between I content of sake and color development during its storage.
CA, V. 75, 1971: 150257b

IWANO, K.; KINUYAMA, Y.; et al.
Quality control of sake for shipment. V. Protection from coloring of sake by the addition of active carbon during storage. (Kanazawa Tax Adm. Bur., Kanazawa, Japan). Nippon Jozo Kyokai Zasshi 1971, 66(7), 695-8 (Japan).

Coloring of sake is inhibited when the sake is stored with active C. A modified Miller method was applied for the detn. of dissolved O. Dissolved O in sake was consumed during storage. Dissolved O in the sake with added active C was reduced to 59-88% of that in sake stored without C. Coloring of sake during storage was reduced to about half.
CA, V. 76, 1972: 97922g

IWANO, K.; KURUMA, K.; et al.
Quality control of sake for shipment. I. Measurement of 3-deoxyglucosone increases during storage. (Kanazawa Tax Adm. Bur., Kanazawa, Japan). Nippon Jozo Kyokai Zasshi 1970, 65(1), 59-62 (Japan).

Carbonyl compds. (I) in sake were sepd. as their 2,4-dinitrophenylhydrazones (II). Amts. of I were almost the same in overmatured sake and new sake. Thin-layer chromatog. on Silica/gel G of II showed that 3-deoxyglucosone (III) increased as the sake became matured. Among II in sake, only the hydrazone of III developed specific color at 550 mμ when it was reacted with alkali (ammonia-ethanol, 1:1). III in sake was detd. as follows: To 0.5 ml of sake, 5 ml of distd. water and 1 ml of 2N HCl contg. 0.2% 2,4-dinitrophenylhydrazine are added. After standing for 30 min at 30°, 10 ml 0.3N NaOH is added to the reaction mixt. to develop color. The color developed is measured at 550 mμ after 30 min.
CA, V. 75, 1971: 150264b

KAZAMA, Y.
The storage of sake. (Inst. Brewing, Ibaraki-ken). J. Soc. Brewing, Japan 1954, 49, 69-72.

The change of d., pH, acid, amino acid, total sugar, reducing sugar, dextrin, EtOH, and amylase activity was detd. during the storage of sake. The effects of light and enzymes were studied, and it was noted that the main factor of denaturation of sake was light, and not enzymes.
CA, V. 49, 1955: 8554a

NAKAMURA, K.; SATO, S.; et al.
Changes in color and flavor of sake caused by exposure to light and storage. VII. Substances effecting color development of sake progressing by deferri-ferrichrome participating reaction. (Res. Inst. Brew., Tokyo, Japan). Nippon Jozo Kyokai Zasshi 1970, 65(12), 1120-5 (Japan).

Coloring reaction of sake by sunlight exposure designated as reaction I in which deferri-ferrichrysin participates required tyrosine, hydroxy- or keto-acid, and kynurenic acid. Detail of reaction I were studied in view of replacement of the reacting components, effects of concn. of the components on color development, and inhibition of the coloring. Kynurenic acid could be replaced by flavine, and tyrosine by tryptophan or tyramine. Deferri-ferrichrysin was the limiting factor of reaction I at the concn. in sake. Optimum concn. of Mn^{2+} was 50 μM, and hydroxy- or keto-acids were present in sufficient amt. in sake for reaction I. Phenolic compds. such as tyrosol and ferulic acid, which were known as sake components, inhibited the color development.
CA, V. 75, 1971: 150258c

SATO, S.; NAKAMURA, K.; et al.
Changes in color and flavor of sake caused by exposure to light and storage. X. Origin of kynurenic acid. (Res. Inst. Brew., Tokyo, Japan). Nippon Jozo Kyokai Zasshi 1971, 66(4), 400-3 (Japan).

Kynurenic acid was necessary for the change in color of sake caused by sunlight. It was isolated from sake by polyamide column chromatog. and analyzed by fluorometry or uv spectrometry. Rice koji did not contain kynurenic acid; it seemed to be produced by yeast during sake fermentation.
CA, V. 76, 1972: 97908g

SATO, S.; NAKAMURA, K.; et al.
Changes in color and flavor of sake caused by exposure to light and storage. XVI. Effects of amino acids on color development of sake during storage. (Res. Inst. Brew., Tokyo, Japan). Nippon Jozo Kyokai Zasshi 1971, 66(7), 723-8 (Japan).

Amts. of amino acids in various sakes were detd. by an amino acid analyzer and their correlations with coloring of the sake were examd.; valine (I), aspartic acid (II), lysine (III), tyrosine, glutamic acid (IV), isoleucine, leucine, and methionine (V), which were in sake before storage were pos. correlated with coloring. V, III, histidine, and tryptophan (VI) in sake were significantly decreased and II, IV, and I were slightly increased during the storage. The neutral- or acid-N fraction (R-fraction) obtained from sake by the ion-exchange resin method was further fractionated into several fractions (P_n-fractions) by the polyvinyl pyrrolidinone column chromatog. Amino acids in R- and P_n-fractions of sake were substituted with the corresponding authentic amino acids and the effects of them on coloring were examd. VI also contributed to the coloring of sake during storage.
CA, V. 76, 1972: 97919m

SATO, S.; NAKAMURA, K.; et al.
Changes in color and flavor of sake caused by exposure to light and storage. XIV. Sake components contributing to color development during storage. (Res. Inst. Brew., Tokyo, Japan). Nippon Jozo Kyokai Zasshi 1971, 66(6), 605-10 (Japan).

Buffer action, absorption at 270, 320, and 420 mμ, and contents of N-D-glycosides (I), 3-deoxyglucosone (II), heavy metals, deferrichromes (III), ferrichromes, kynurenic acid, ferulic acid (IV), flavine (V), tyrosol, and tryptophol were measured on 22 unpasteurized fresh sake samples. Ordinary components were also detd. Color development caused by storage was pos. correlated to amino acid content, buffer action, absorbence at 270, 320, and 420 mμ of sake before storage, and to increasing amts. by storage of I and II. It was also pos. correlated to contents of Zn, III, IV, and V; their addn. to sake, however, did not enhance color development, so they seemed to be indirect components only suggesting the coexistences of same effective components. Sake components were fractionated into 5 fractions by ion-exchange resins, Dowex A-1, IRC-50, Ir-120, and IR-45. The neutral- or acid-N fraction (R fraction) had the strongest effect on the color development. Accumulation of intermediates of the coloring reaction into R fraction in-

creased during storage, with addn. of SO_2 to sake. I or its amadori rearrangement products were presumed to be one of the intermediates.
CA, V. 76, 1972: 111672j

SATO, S.; NAKAMURA, K.; et al.
Changes in color and flavor of sake caused by exposure to light and storage. VIII. Color development without the participation of deferri-ferrichrysin. (Res. Inst. Brew., Tokyo, Japan). Nippon Jozo Kyokai Zasshi 1971, 66(1), 57-61 (Japan).

A fraction which was adsorbed on Amberlite IR-120 and eluted by 1 N NaOH was obtained from sake. The fraction (which became colored on exposure to sunlight) was further fractionated into several components by chromatog. on Dowex 1-X8 (acetate form). Thin-layer chromatog. of the components and coloring reactions of combinations of the components indicated a coloring scheme in which tyrosine (or tryptophan) and kynurenic acid (or riboflavine) participated but deferri-ferrichrysin did not.
CA, V. 76, 1972: 111676p

SATO, S.; TADENUMA, M.; et al.
Changes in color and flavor of sake caused by exposure to light and storage. XVII. Discrimination between colorings of sake caused by exposure to light and those that appeared during storage. (Res. Inst. Brew., Tokyo, Japan). Nippon Jozo Kyokai Zasshi 1972, 67(3), 246-9 (Japan).

Ferricyanide-reducing substances (FRS), deferri-ferrichrysin,kynurenic acid, and flavine were decreased in sake colored by sunlight. FRS and 3-deoxyglucosone were increased in the sake colored during storage. Ratio between optical absorption of sake measured at 270 and that measured at 265 mμ with 10 mm cell ($OD^{270}_{10}/OD^{265}_{10}$) was >1 in the sake colored during storage, while it was <1 in the sake colored by sunlight.
CA, V. 77, 1972: 150548p

SATO, S.; TADENUMA, M.; et al.
Changes in color and flavor of sake caused by exposure to light and storage. XVIII. Change of the substances adsorbed on Amberlite IRC-50 during the storage. (Res. Inst. Brew., Tokyo, Japan). Nippon Jozo Kyokai Zasshi 1972, 67(6), 548-51 (Japan).

Some components in sake which had been adsorbed on Amberlite IRC-50 were changed to other substances which were not adsorbed on the resin by heating or during storage. The newly formed substances contained adenine, pentose, S, and P.
CA, V. 78, 1973: 27869n

SATO, S.; TADENUMA, M.; et al.
Changes in color and flavor of sake caused by exposure to light and storage. XIX. Origin of C-substance and purine X in sake. (Res. Inst. Brew., Tokyo, Japan). Nippon Jozo Kyokai Zasshi 1972, 67(7), 654-5 (Japan).

Some substance which is adsorbed on Amberlite IRC-50 and tentatively called C-substance changes to another substance tentatively called

purine X, which is not adsorbed on the resin, during storage. Most of the C-substance originated from yeast cells.
CA, V. 78, 1973: 27868m

TAKAHASHI, K.; SATO, S.; et al.
Changes in color and flavor of sake caused by exposure to light and storage. XV. Effect of metals on color change during storage. (Res.Inst. Brew., Tokyo, Japan). Nippon Jozo Kyokai Zasshi 1971, 66(6), 611-5 (Japan).

Mn^{2+}, Cu^{2+}, and Zn^{2+} in sake were removed by adsorption on Dowex A-1, repressing color development of the treated sake during storage. Eluate (M fraction) from Dowex A-1 with N HCl showed effective coloring reaction of the sake treated with Dowex A-1. As the same effect was shown by the ashed M fraction, the effect of the M fraction was due to metallic ions in the eluate; coloring was stimulated by Mn^{2+}, Cu^{2+}, and Fe^{3+} in the M fraction. Metal adsorbing activities of various resins and an active C were examd.; Dowex A-1 was the most effective among them.
CA, V. 76, 1972: 97918k

TAKAHASHI, K.; SATO, S.; et al.
Changes in color and flavor of sake caused by exposure to light and by storage. XX. Colored substances which appeared during storage. (Res. Inst. Brew., Tokyo, Japan). Nippon Jozo Kyokai Zasshi 1972, 67(8), 726-30 (Japan).

The colored substances in sake were adsorbed on Dowex 50W X 4 (H),eluted with 0.15 N NH_4OH, and fractionated into A and B fractions with Amberlite IR-45 (OH). They were further fractionated into 8 fractions on Sephadex G-50 and G-25. Certain fractions which had a dense color were further fractionated and purified on a DEAE-cellulose column. The colored substances consisted of aspartic acid, glutamic acid, glycine,lysine, and cysteine along with Fe, Ca, Mg, Zn, Cu, and Mn. No carbohydrate was detected. From addnl. data such as qual. reactions , ir absorption spectra, the colored substances were inferred to be melanoidins with a mol. wt. of ~10,000.
CA, V. 78, 1973: 70155p

II FERMENTED SOY BEANS

A. SOYSAUCE

a. Method of Preparation

AMANO, T.

Use of soybean steepwater in Tamari soy sauce brewing. Aichi-Ken Shokuhin Kogyo Shikensho Nempo 1973, 14, 15-23 (Japan).

The chem. compn. and properties of soybean steepwater were studied to det. the possibility of use of the water in Tamari soy sauce brewing. The H_2O absorption by and extn. of solids from soybeans increased with increasing steeping time and temp. However, at a fixed steeping time and temp., the values were not affected by the vol. of H_2O. Trypsin inhibitor [9035-81-8] was inactivated at 110-150° in powd. soybeans, and at 100° in an aq. soln. Only a low activity of trypsin inhibitor was detected in soybean steeping water, viz., 0.0246% after 1-hr steeping and 0.0471% after 5 hr. Treatment with proteases from fungi, Bacillus subtilis, and Bisadiomycetes did not alter the activity of trypsin inhibitor. No difference was obsd. in the chem. compn. of the soy sauces from brewing using regular water, raw soybean steepwater, or heated soybean steepwater.
CA, V. 84, 1976: 29384y

BEANS-ARCEGA, L.

Sauce manufacture. (Biol. Res. Cent., Natl. Inst. Sci. Technol., Manila, Philippines). Process Biochem. 1970, 5(10), 50-1, 56 (Eng).

A review of the manuf. of fish and soy sauces with emphasis on the control of enzymic hydrolysis in relation to flavor. 13 refs.
CA, V. 74, 1971: 52176j

BEATRICE FOOD CO.

Soy sauce. Fr. Demande 2, 172,-812 (Cl. A 23l), 09 Nov 1973, Appl. 72 06,031, 23 Feb 1972; 19 pp.

A brief (7-30 days) procedure for making soy sauce with all the body and flavor of the traditional product is described. Before fermn. the mixt. (maromi) is inoculated with Saccharomyces, Debaromyces, bacteria isolated from an aged maromi, or with several of these organisms at the same time. Fermn. is conducted with intermittent or no aeration for at least 3 days, and preferably for 7-30 days, in 2 stages at 2 temps.
CA, V. 80, 1974: 94395j

FUKAI, T.

Fish and soy sauce. II. Miso Shoyu Ind. 1947, 7(7-9), 3-10

Soy sauce made from the squid by auto digestion contains the following HCl-sol. N: amino N 13.26, humin N 3.87, alginine N 10.92, histidine N 8.88, lysine N 10.58, cystine N o.44, total diamino N 30.80, total monoamino N 52.72, and nonamino N 1.30;

that from the octopus, 14.62, 2.53, 9.44, 9.85, 10.57, 0.98, 30.84, 52.40 and 4.96, resp.; that from the sardine, 14.95, 2.19, 8.50, 10.51, 11.36, 0.65, 31.02, 50.75, and 5.77%, resp. Compared to the common soy sauce from soybeans, the fish soy sauce contains a very large amt. of lysine N (6.28% in soybean soy sauce) and a small amt. of humin N (6.30% in soybean soy sauce).
CA, V. 44, 1950: 6985i

FURUTA, T.; MAEDA, K.
Brine for soy sauce manufacture prepared by an ion-exchange membrane method. I. Preliminary examinations. (Tatsuno Soy Lab., Tatsuno, Japan). Chomi Kagaku 1974, 21(3), 23-6 (Japan).

The brine produced by treating seawater with an ion-exchange membrane contained 19 g NaCl/dl and considerable amts. of Mg and Ca. The bitter taste of this soln., which made it unsuitable for food processing, was removed by treating the brine with NaOH and Na_2CO_3.
CA, V. 83, 1975: 191478h

GENIN, S.A.
Production of soy sauce. Pishchevaya Prom. 1944,(12), 51-4.

For the production of protein hydrolyzates under war conditions in the Soviet Union, a long (40-45 days) biochem. fermentation is preferred to an acid hydrolysis. Conditions are presented for obtaining high yields of hydrolyzate.
CA, V. 40, 1946: 427[7]

IBRAHIM
Soy-sauce processing. Science Meeting on Food Proteins and Soybean Processing, Bandung, Lembaga Kimia Nasional, LIPI, 1-2 Juni 1972.

High amino-acid content in soybean, in acid solution will form H-protein at the point when the iso-electric solubility of the mentioned compound reaches the minimum number (Ziemba, 1966). While in soy-sauce processing, the isolated amino acids in salt solution in the form of dissolved molecules or as dispersed particles forming a suspension. The solvability is maximum when the pH is neutral. By the method of acid hydrolysis or by the activity of proteolytic enzyme (fermentation process), before the soaking in salt solution will be obtained enough quality of amino-acids originated from soybeans.
Author

ICHIKAWA, H.
Chemical studies on methods for rapid brewing of shoyu and their by-products. I. Hydrolyzate of the soybean cake by concentrated hydrochloric acid at ordinary temperature and its shoyu fermentation. Bul. Sci. Fakult. Terkult. Kyushu Imp. Univ. Fujuoka, Japan 1942, 10(1), 1-17.

Hydrolysis of soybean cake by concd. HCl at 35° results in almost quant. hydrolysis of carbohydrate portion with slight formation of futural which inhibits the fermentation by shoyu-koji. The

hydrolyzate (I) is black rather than the red characteristic of high-grade shoyu; it has no unpleasant taste or odor as do high-temp. hydrolyzates. I gives neg. protein test after 24 hrs. and after 72-120 hrs. has a peptone content analogous to shoyu-moromi fermented 8-10 months. Addn. of a small amt. of shoyu-koji to I yields a product similar to ordinary fermented shoyu.
CA, V. 43, 1949: 5154^{i}

JO, J.S.; PAIK, Y.T.; et al.
Traditional Korean soy sauce; components total nitrogen and common salt. (Coll. Med., Kyung Pook Univ., Taegu). New Med. J. (Seoul, Korea) 1964, 7(10), 85-7.

The av. value of total N in soy sauce is 0.58 ± 0.169 g./dl. The av. concn. of NaCl in soy sauce is 27.3 ± 2.86 g./dl.
CA, V. 61, 1964: 16705^{f}

KAE, I.P. and KI, J.K.
Studies on manufacturing of the Korean soy sauce (I). Rep. Nation. Ind. Res. Inst. 1970, 20, 89-98.

The ordinary Meju samples collected from various districts were tested on the physiological and chemical characteristics, and useful microorganisms of superproteolytic enzyme activity were also isolated. Then 5 kinds of new Meju were prepared with those useful microorganisms by fermentation for 96 hrs, and Korean soy sauce was made with the above new Meju in flask scale, for 4 weeks in 20% NaCl solution. Accordingly, several nitrogen compounds, protease activity, pH, extracts, and etc. were analysed throughout this study and the experimental results indicate as follows:

1. The moisture and total nitrogen in the ordinary Meju samples are decreased in proportion from surface to inner core, but amino nitrogen and ammonia-nitrogen are increased.
2. Micro flora in the ordinary Meju samples is of almost bacteria in the majority, and, the colour density, amino-nitrogen and ammonia-nitrogen are increased in proportion as the bacteria count is increased, and the pH up to 8.7.
3. 2 kinds superproteolytic bacteria strains are isolated from ordinary Meju samples, No. B11-33 (1960 μ/g Folin) and No. B 83-20(1351 μ/g Folin) are identified as Bacillus subtilis, both of them, by means of the Bergey's Manual of Determinative Bacteriology.
4. The new Meju are prepared with Bacillus subtilis, strain No. B11-33 and so is Korean soy sauce with the Meju and are tasted as sensory test with roomate in this lab., accordingly taste is good but still beyond the satisfaction for the Meju smell.
5. There are 16 kinds amino acids in the new Korean soy sauce prepared in this study.

Korean Sci. Abstr., V. 4 (1) 1974: 108

KAJIMOTO, Y.
Depressor effect of soy sauce. (Univ. Tokushima, Japan). Shokuhin Eiseigaku Zasshi 1963, 4, 123-9

A review with 129 references.
CA, V. 60, 1964: 4688g

KIMURA, G.
Manufacture of soy sauce. Japan. 73 10,557 (Cl. C 12x), 04 Apr 1973, Appl. 69 26,849, 09 Apr 1969; 4 pp.

Soy sauce is produced economically in a short time by fermenting rice bran residues in amino acid solns. in the presence of yeasts. Ordinarily, the prepn. of soy sauce by brewing requires 1-3 years, but the fermn. period is reduced to 6 months by this method. The use of rice bran instead of wheat bran reduced the cost of prodn. considerably. Thus, 5 kg defatted rice bran was treated with 0.8% HCl soln. (50 kg) for 1 hr at 20° and the residue bran was isolated by centrifugation, washed with water, and dried. On the other hand, an amino-acid soln. was prepd. by hydrolyzing 5.2 kg defatted soybeans in HCl and NaCl soln. at 93-7° for 43 hr. The mixt. of the modified rice bran and the amino acid soln. was heated at 95-100° for 1 hr, and after being cooled it was fermented with yeast at 20-30° for 32 days. The mixt. was slowly filtered over a 6-day period, and the filtrate left for 4 days to removed pptd. materials. It was then heated once at 77° and filtered to obtain 24 l. soy sauce.
CA, V. 80, 1974: 46648x

LOCKWOOD, L.B.; SMITH, A.K.
Fermented soy foods and sauce. Yearbook Agr., U.S. Dep. Agr. 1951, 357-361.

Over de bereiding van voedingsproducten uit soja langs chemische weg of met behulp van gisting met schimmels (Aspergillus oryzae), bacteriën (Lactobacillus delbrückii) en gisten (Zygosaccharomyces soja, Z. major e.a.).
Royal Tropical Institute, Amsterdam, 3996.

LULLA, B.S.; JOHAR, D.S.; et al.
Preparation of predigested protein foods. (Central Food Technol. Research Inst., Mysore). Proc. Symp. Proteins Mysore, India 1960, 307-11 (Pub. 1961).

The importance of predigested foods, particularly soybean products, for the people of the Orient is discussed. For a large scale production of soy sauce: soak 100 lb. cleaned soybeans for 18 hrs., cook under 15 lb./sq. in. for 2 hrs., mix with 50 lb. cracked, light-brown roasted wheat at room temp., inoculate with 3 kg. koji. Keep 2-3-in. thick cultures 4 days at 26-30°. Mix the resulting moldy material in 400-l. wooden barrels with 120 l. 20% brine, ripen 3 months at 26-30°, press, and leach to yield 220 l. ext. After flocculation by heating and addn. of 15 g. alum, centrifuge, add 750 p.p.m. Na benzoate, and bottle the 80° -sterilized liquid. 13 references.
CA, V. 57, 1962: 8967i

MASILUNGAN, V.A., et al.
Studies on some important factors involved in the mold process of making soy sauce. Philippine J. Sci 1960, 89 (2), 149-62.

The various phases of soy sauce manufacture were studied in the Philippines, aiming at improving the quality of the sauce. Nist-7,

an intermediate form between the moulds Aspergillus flavus and A. oryzae was found to be superior to other mould strains. A mixture of 2 parts soybean and 1 part wheat flour. a 20 % salt solution, temperatures ranging from 40-50°C, a moulding period of 4 days and fermentation during 4 weeks formed the ideal combination of factors for a good sauce with the highest protein content. Tables. 16 refs.
Royal Tropical Institute, Amsterdam, j3020.

MOGI, M.
Recent studies on soy-sauce brewing. (Noda Sangyo Kagaku Kenkyusho, Chiba-ken). Hakko Kyokaishi 1959, 17, 78-86

A review with 58 references.
CA, V. 53, 1959: 10654f

MOGI, M.; IGUCHI, N.
A review of studies on soy sauce and miso in 1957. (Noda Ind. Research Inst., Chiba-ken). Nippon Jozo Kyokai Zasshi 1958, 53, 282-93

A review chiefly from a biochem. viewpoint. 155 references.
CA, V. 55, 1961: 8752g

MORSE, W.J.; CARTTER, J.L.
Soyabeans for feed, food, and industrial purposes. Farmers' Bull. U.S. Dep. Agr. 1952, 2038, 1-41.

The various uses of soyabeans and their by-products e.g. direct use on the farm, processing for meal and oil and their applications, preparation for human consumption and miscellaneous uses. Phot.
Royal Tropical Institute, Amsterdam, a1420.

MURATA, K.; YAMAMOTO, Y.; et al.
Electrically heating and rapid brewing of shoyu. Comparison of raw-material utilization between two processing methods. (Shoyu Expt. Sta., Kagawa-ken). Kagawaken Shoyu Shikenjo Hokoku 1957, (49), 41-6

In method A (tomegama) defatted soybeans were steamed, let stand overnight, then added to wheat and brewed. In method B (sokujitsu-morikomi) steamed soybeans were added to wheat without standing overnight. The utilizations were higher in method B than in method A concerning total N, ext. other than NaCl, reducing sugar, and EtOH.
CA, V. 53, 1959: 10654g

NAGASE, I.
Brewing method for soy sauce moromi without common salt. IV. Effects of organic acid compounds as antiseptics for soy sauce moromi not containing common salt. (Dep. Beverages Fermented, Agric. Univ. Tokyo, Tokyo, Japan). Chomi Kagaku 1973, 20(5), 25-30 (Japan).

The preservative activity of 31 org. acid compds. was examd. in the salt-free soy sauce fermn. Fermn. was carried out for 15 days at 30° with the addn. of 0.05% org. acid and flavor and odor were evaluated every day. Most compds. had some activity;

benzoic acid [65-85-0], salicylic acid [69-72-7], sorbic acid [110-44-1], p-hydroxybenzoic acid [99-96-7], and ascorbic acid [50-81-7] were considered useful.
CA, V. 83, 1975: 176908e

NAGASE, I.
Brewing method for soy sauce moromi without common salt. V. Effectiveness of several kinds of sulfites as antiseptics for soy sauce moromi not containing common salt. (Agric. Univ. Tokyo, Tokyo, Japan). Chomi Kagaku 1974, 21(3), 27-31 (Japan).

Satisfactory results were obtained in preventing putrefaction of soy mash by using 0.05% of Na sulfite [7757-83-7], Na bisulfite [7631-90-5], K metabisulfite [16731-55-8], Na thiosulfate [7772-98-7] and Na nitrite [7632-00-0]. Formation of SO_2 and NO_2 was assumed at an early stage of the fermn. which effectively prevented putrefaction; at later stages org. acids formed during fermn. were effective in this regard.
CA, V. 83, 1975: 176928m

NAKATANI, K.; MATSUMOTO, F.; et al.
Effects of soysauce (shoyu) on the texture of foods during the process of cooking. II. (Ochanomizu Joshi Daigaku, Tokyo, Japan). Kaseigaku Zasshi 1974, 25(3), 201-6 (Japan).

Various org. acids and ions present in soy sauce were examd. for the cause of hardening of soybeans cooked in the sauce. All the 16 acids, including glutamic and aspartic acids, and Ca^{++}, Mg^{++}, and Fe^{3+} gave hard textured beans, whereas Na^+ and K^+ gave soft beans when compared with those cooked in H_2O alone. The addn. of AcOH, lactic and succinic acids to a 0.4M buffered soln. contg. 5 g NaCl/dl gave soft textured beans compared with those cooked in 0.1M org. acid contg. 5 g NaCl/dl or in soy sauce alone.
CA, V. 81, 1974: 103435x

NASUNO, S.
Review of studies on soysauce and miso. (Noda Inst. Sci. Res., Noda, Japan). Nippon Jozo Kyokai Zasshi 1975, 70(5), 317-35 (Japan).

A review with 539 refs. of results published in Japan in 1974.
CA, V. 83, 1975: 176730r

NATIONAL INSTITUTE FOR CHEMISTRY
Research design for soybean processing and utilization. ASEAN Expert Meeting for Soybean Processing and Utilization, Bandung 1972. App. 7, p. 16.

Research project to improve the quality and nutritional value of soybean sauce and also to obtaine soybean sauce which is not only pleasant tasting but also a valuable protein source. Soybean souce is usually used to enhance the taste of food. It is well-known in Asian countries, including Indonesia under the name "Kecap". The majority of the people use the sauce merely because of its pleasant taste, but the plan is to raise its protein

content to a sufficiently high level. Soybean sauce is obtained by a special processing of soybean, but each place has its own method and obtains a variety of soybean sauces each with its own peculiar taste, flavor and nutritional value. In soybean sauce processing (i.e. "Kecap"), the main raw material is the soybean meal which has a high protein content.
ASEAN Expert Meeting Bandung

NATIONAL INSTITUTE FOR CHEMISTRY
Research design for soybean processing and utilization. ASEAN Expert Meeting for Soybean Processing and Utilization, Bandung 1972. App. 7

p. 21. "List of equipment for soybean sauce processing"
p. 22. "Personnel requirement for soybean sauce processing"
p. 23. "Estimate cost for soybean sauce processing"
p. 24. "Progress chart for soybean sauce processing".
ASEAN Expert Meeting Bandung

OKAMOTO, T.; TAKEGAMI, I.
Ion exchange column chromatography of nucleotides contributing to the taste of shoyu (soy sauce). (Kagawa Ferment. Food Exp. Stn., Kagawa, Japan). Chomi Kagaku 1973, 20(11), 15-20 (Japan).

IMP /131-99-7/ and GMP /642-41-1/ in soy sauce were detd. by liq. chromatog. on LCR-1 (cation exchange resin) or LCR-3 (anion exchange resin). A sample (1 ml.) was passed through HP-40 (a high porous polymer), eluted with 100 ml. HCL (pH 2.0), the eluate passed through active C, eluted with 20 ml. 2.8% NH_4OH, evapd. in vacuo, and dissolved in 10 ml. H_2O. The soln. (1 ml.) was submitted to liq. chromatog. on LCR-1 (column diam. 0.8 length 15 cm.) with 0.2N HCl, and IMP and GMP were detd. by absorbancy at 250 mμ.
CA, V. 83, 1975: 176926j

PARK, K.I.; KIM, K.J.
Studies on manufacturing of the Korean soy sauce (I). Rep. Nation. Ind. Res. Inst. 1970, 20, 89-98, 2 Fig. 10 Tab. 10 Ref.

The ordinary Meju samples collected from various districts were tested on the physiological and chemical characteristics, and useful microorganisms of superproteolytic enzyme activity were also isolated. Then 5 kinds new Meju were prepared with those useful microorganisms by fermentation for 96 hrs, and Korean soy sauce were made with the above new Meju in flask scale, for 4 weeks in 20% NaCl solution. Accordingly, several nitrogen compounds, protease activity, pH, extracts, and etc. were analysed throughout this study and the experimental results indicate as follows:

1. The moisture and total nitrogen in the ordinary Meju samples are decreased in portion from surface to inner core, but amino nitrogen and ammonia-nitrogen are increased.
2. Micro flora in the ordinary Meju samples is of almost bacteria in the majority, and, the colour density, amino-nitrogen and

ammonia-nitrogen are increased in proportion as the bacteria count is increased, and the pH up to 8.7.

3. 2 kinds superproteolytic bacteria strains are isolated from ordinary Meju samples, No. B 11-33 (1960 μ/g Folin) and No. B 83-20(1351 μ/g Folin) are identified as Bacillus subtilis, both of them, by means of the Bergey's Manual of Determinative Bacteriology.
4. The new Meju are prepared with Bacillus subtilis, strain No. B11-33 and so did Korean soy sauce with the Meju and are tasted as sensory test with roomate in this lab., accordingly taste is good but still beyond the satisfaction for the Meju smell.
5. There are 16 kinds amino acids in the new Korean soy sauce prepared in this study.

Korean Sci. Abstr., V. 4, 1972: 108

PARK, K.I.; SUNG, H.S.; et al.

Manufacturing of the Korean soy sauce. 2.Preparation of Meju. (Food Ind. Sect., Natl. Ind. Res. Inst., Seoul, S. Korea). Kung-nip Kongop Yonguso Pogo 1971, 21, 105-15 (Korean).

This study was carried out to investigate the best conditions for meju prepn. by Bacillus subtilis strain B11-33. The change of various N compds., moisture content, pH, proteolytic enzyme activities and free amino acids were detd. during meju fermn. and its subsequent drying. The results were as follows: (1) During meju fermn., the moisture and total N contents were not changed. Insol. N and sol. N decreased about 80% and 5% of the total N, resp. The content of PAA (total peptide-, amino-ammonia)-N increased to~70% of the total N during 72 hr fermn. Peptide N peaked after 12 hr fermn. and then decreased gradually. Free amino acids increased very rapidly from 24 hr to 72 hr fermn., except for tryptophan. Among them, valine was not detected in any stage as a free amino acid, but it was detected in HCl-hydrolyzed samples of steeped and cooked soybeans. (2) During meju drying, the moisture contents decreased more in the 36 hr-fermented sample than in the 24 hr-fermented sample. The contents of PAA-N and ammonia-N were not changed at 50° and 60° drying temp. but at 40° are increased continuously. (3) According to the results of this study the best conditions are fermn. for 24 hr, incubation temp. of 37°, and with use of strain no. B11-33 and then drying for 48 hr at 40°.

CA, V. 79, 1073: 51955d

SINTHA

Pembuatan kecap secara hidrolisa (Soy-sauce processing by hydrolysis). Bandung, Departemen Biologi, I.T.B. 1974. 21 p.
A report of practical work.

Soy-sauce obtained as an experiment result has a brown-black colour, diluted and has a little ammonium smell. It is clear that soy-sauce processing by acid hydrolysis is quite easy to do and in a short time a lot of products can be obtained as a result. Soy-sauce obtained by the fermentation method has a better taste and aroma than that by acid hydrolysis. This is caused by the

role played by the micro-organisms. For instance the species Aspergillus, Rhizopus, and Mucon (Ibrahim, 1972). By mixing soy-sauce obtained by acid hydrolysis and that by fermentation will result in a good quality soy-sauce. For this, further research needs to be carried out.
Author

SORIANO, M.; et al.
Studies on the preparation of "soy" sauce from coconut paring meal. Philippine J. Sci. 1967, 96(2), 129-37; received 1969.

In the Philippines, sauces were prepared by the acid and mould-enzyme hydrolysis methods using coconut paring meal (coat of coconut meat, directly adjacent to shell), soya beans and combinations of paring meal and soya beans in varying proportions. The acid hydrolysates gave higher specific gravity, more total solids, and content. Acid hydrolysates from mixtures containing 2 parts of paring meal 1 part of soya bean, and from equal parts of paring meal and soya bean, were preferred in flavour and aroma. Tables. 12 refs.
Royal Tropical Institute, Amsterdam, s2518.

THIO, G.L.
Small-scale and home processing of soya beans with applications and recipes. Dept. Agr. Res. Roy. Trop. Ins. Amst. 1975, 64, 51p.

It presents several methods and examples of possible applications and recipes, mainly based on locally available raw materials and equipment, to improve the diet; they are not beyond the capacity and purchasing power of the population in the tropics and subtropics. The importance of soya beans in the human diet for supplying proteins, oil, vitamins and minerals is wellknown. In most publications of this type emphasis is laid on the production and processing in modern and sophisticated factories. Here it is tried to stress the application in small-scale, cottage and home industries, and domestic use. The author Grew up in Southeast Asia with soya beans and soya bean products. He has used the soya bean as his main research project for many years and is publishing the results of his investigations with the intention to provide all persons, working with soya beans on a small-scale, with practical and simple methods, and with examples of applications for daily use. He has tried to avoid sophisticated and expensive equipment in designing the described methods and recipes.
Author.

TOYAMA, N.; KAMADA, M.
Improvement of the brewing process of soy-sauce. Miyazaki Daigaku Nogakubu Kenkyu Jiko 1958, 3, 18-22

Aging period of neutralized acid-hydrolyzate of soybean was shortened by lowering the concns. of lactic acid (below 1%) and of NaCl (to about 8%) to be added.
CA, V. 52, 1958: 1900b

UMEDA, I.; TATENO, S.
Manufacture of "New No. 2 Soy Sauce". (Noda Soy Sauce Co., Chiba-ken). Shokuryo no Kagaku (Sci. of Foods) 1949, 3, 20-3

Soybean meal (or defatted soybeans of soybean flour) was hydrolyzed either in a single operation (with 6% HCl 3 parts for 10 hrs.) or in a double operation (with more dil. HCl than 4% and then with 4-6% HCl). The hydrolyzate was neutralized to pH 5.5 with powd soda ash, and NaCl was added with strong stirring. Koji made from copra meal (or oil cakes or wheat bran) was added to the neutralized soln. at 45°. "New No. 2 Soy Sauce" was pressed after aging 1 month at this temp. This has 2 advantages: the rate of utilization of N in the raw material is equal to or more than (80-83% or more) than in the case of amino acid seasoning (obtained by total chem. hydrolysis of proteinic raw material), and the taste, flavor, and color are near that of ordinary soy sauce (obtained by brewing). The time necessary for the manuf. is intermediate: amino acid seasoning, several hrs.; ordinary soy sauce, about 1 year.
CA, V. 47, 1953: 2427^{b}

WANG, H.L.; HESELTINE, C.W.
Sufu and lao-chao. (Northern Reg. Lab., U.S. Dep. of Agr., Peoria, Ill.). J. Agr. Food Chem. 1970, 18(4), 572-5 (Eng).

Pure culture fermentation methods were developed for 2 centuries-old Oriental fermented foods, one a soybean product and the other a rice product. Both possess the kind of texture, appearance, and mild flavor to which people of many areas of the world are accustomed. The changes during fermentation processes are described.
CA, V. 73, 1970: 86614v

YAMAMOTO, Y.
Foaming of shoyu and silicone antifoaming agent. (Shôyu Expt. Sta., Kagawa-ken). Kagawa-ken Shôyu Shikenjô Hôkoku 1957, (49) 33-41

Foaming was higher in chem. shoyu (soybean hydrolyzate with Hcl) than in brewed shoyu, presumably owing to higher oil content of the former. Foaming was increased by heat sterilization and addn. of caramel. Foaming was decreased by filtration of shoyu with Celite. Foaming increased as pH was lowered. Addn. of 2-5 p.p.m. of silicone controlled the foaming of shoyu.
CA, V. 53, 1959: 10654h

YAMAMOTO, Y.; SHIROGAMI, M. et. al.
Soy sauce brewing with NaCl containing ferric ammonium citrate as antilumping agent. (Kagawa Fermented Foods Expt. Station, Uchinomi, Japan). Kagawa-ken Hakko Shokuhin Shikenjo Hokoku 1963, 55, 16-22 (Japan).

The color and flavor of soy sauce brewed with NaCl contg. 50 ppm. ferric ammonium citrate as the anti-clumping agent were not different from those with usual NaCl. Ferric ammonium citrate, contained in NaCl in the concn. of 50 ppm., did not inhibit the fermentation or solubilization of N by enzymes.
CA, V. 65, 1966: 4547h

YOKOTSUKA, T.
Shoyu. (Cent. Res. Lab., Kikkoman Shoyu Co., Ltd., Noda, Japan). Proc. Int. Symp. Convers. Manuf. Foodst. Microorganisms 1971, (Pub. 1972), 117-25 (Eng). Saikon Publ. Co. Ltd.: Tokyo, Japan. A review with 68 refs.

The amino acid-contg. seasonings include those prepd. from fish in Thailand and Vietnam, from soybeans in China and Korea, and from wheat and soybeans in Japan. Technol. and compn. are discussed.
CA, V. 82, 1975: 110331j

YOSHIBI, M.
Advancement in manufacture of soy sauce. Nucleic acid for seasoning agents for soy sauce. (Yamasa Shoyu Co., Chiba, Japan). Hakko Kyokaishi 1965, 23(11), 497-502 (Japan).

Tech. problems in using nucleic acids as seasoning agents for soy sauce were discussed.
CA, V. 64, 1966: 11771b

YUTONO; DARMOSUWITO, S.
Proses pembuatan kecap (The process of soybean sauce making). Science Meeting on Food Proteins and Soybean Sauce Proceesing, Bandung, Lembaga Kimia Nasional, LIPI, 1-2 June 1972.

The basis of soybean sauce making is a fermentation chemical hydrolysis. In broad outline, soybean sauce making by fermentation there are 6 stages of process:

I. Selection of the soybeans to be used (kind, quality)
II. Preparations (washing, soaking, boiling, possibility crushing, draining etc)
III. Fermentation: A. Mold fermentation
B. Brine fermentation
IV. Extraction (sieving, boiling with diverse variation and combinations)
V. Further processing (boiling followed by filtration and clarification; adding caramel; boiling with spices followed by filtration and clarification; other variations and combination
VI. Bottling.

Author

b. Microorganism

AMANO, T.; TAKEUCHI, T.; et al.
Shoyu preservative. VI. Hydrolytic enzyme acting on buthyl p-hydroxybenzoate contained in shoyu. Chomi Kagaku 1967, 14(3), 1-7 (Japan).

Nonheated shoyu contained an esterase (I) acting on Bu p-hydroxybenzoate, presumably from koji. I showed max. activity at pH 7.0 and 30-50°. NaCl and other components of shoyu had no remarkable

effects on I activity.
CA, V. 71, 1969: 69439h

CHOW, K.Y.

Enzymes of Aspergillus and biochemistry of the fermentation of the soybean. Univ. catholique Louvain, Inst. agron., Mem. Collection in 4°, 1951, (4), 11-94

Proteolytic and amylolytic action is measured by a new "link" method adapted from Heatley's penicillimetry (cf. C.A. 38, 5365^4), in which the zone of hydrolysis of the substratum is measured in a gelatin medium. Several glass rings contg. the soln. to be studied are placed on a layer of a gelatinous soln. of the enzyme studied in a Petri box. The Petri box is incubated at a favorable temp. for enzymic action and studied for the transformation of the layer. Both exo- and endo-proteolytic and amylolytic enzymes may be obtained in the active form by pptn. from alc. but not by the addn. of $(NH_4)_2SO_4$. They may be further purified by dialysis with a collodion membrane. Although not identical, the endoproteinase and exoproteinase are similar and have the following properties: optimum temp., 45°, optimum acidity, pH 6.0; are not destroyed by heating 25 min. at 80° or 1 min. at 90°; $CaCl_2$ activates their prepn.; 0.05M thioglycolic acid and 0.05M KCN inhibit their action; 0.05M glutathione activates the endoproteinase without influencing the exoproteinase. These enzymes decomp. casein into a series of free amino acids which correspond to that obtained by acid hydrolysis of casein. The proteinase and amylase may be sepd. chromatographically on a column of amidon, with an $(NH_4)_2SO_4$ soln. (30-35%) pH 6.5. Proteolytic and amylolytic powers of fragments of different ages may be detd. in the same column of molds, since these powers are directly proportional to the age of the zones providing the fragments. The results are given of studies made of 6 different forms of aspergilli.
CA, V. 48, 1954: 7091e

CHU, Y.H.; YU, T.J.; et al.

Studies on the film forming yeasts isolated from commercial soy sauce. Kor. J. Food. Sci. Technol. 1975, 7(2), 61-8, 3 Fig. 13 Tab. 21 Ref. (Article in Korean)

This study was conducted (1) to isolate the film-forming yeast from the commercially available soy sauce, (2) to identify the state of soy sauce fermentation by the use of yeasts, (3) to confirm characteristics of yeasts. The result were as follows:

1. These yeast strains in the soy sauce fermentation test showed full fermentation of whole sugar content. reduction of the pure extract and relative reduction in total nitrogen. Soy sauce color was somehow faded to lower the stability of soy sauce.
2. In anti-fungal activity test butylparaben at a higher level 60 ppm., sodium propionate 2,400 ppm, sodium benzoate 800 ppm., menadion 165 ppm, showed their anti-fungal effect, while alcohol did not show the effect in the 3% additive group.
3. The optimum sodium chloride concentration for these strains in the 2% G.Y.P. medium was 5% and optimum temperature was 30°C. The extinction temperature was 62°C for strain No-1 and No-3, and was 65°C for No-2 and No-4.

4. The film-forming soy sauce turned out in the gas chromatogram to possess much flavor of low boiling point as compared with the standard. These flavors were considered due to flavor spoilage of the soy sauce.
5. These isolated yeasts were identified Saccharomyces rooxii (film-forming yeast) in the Lodder's taxonomic study.

Korean Sci. Abstr, V. 7, 1975: 670

FUJISHIMA, T.; CHIBA, H.; et al.

Phosphatase in shoyu. II. Changes of phosphatase activity during shoyu fermentation. Chomi Kagaku 1967, 14(4), 8-15 (Japan).

The phosphatase (I) present in a dialyzed soln. of shoyu had optimum activity at pH 4.8 and 55°. I activity decreased to 87% in 1 month and continued to decrease gradually to 82% in 4 months and to 80% in 6 months fermentation. The stability of I changed from pH 6.0 to 4.0, and the optimal temp. changed from 50 to 55° during fermentation; thus shoyu may have contained at least 2 different I enzymes. Na tungstate and Na molybdate inhibited I, presumably not by inactivating I itself, but by inhibiting the enzymic reaction. At 1%, 1,3-butanediol showed 89% residual activity, 1,4-butanediol 84%, 2,3-butanediol 92%, 1,5-pentanediol 68% (the most potent inhibitor), and 2-methylpentance-2,4-diol 89%. The activity of I increased toward 5'-adenylate, 5'-guanylate, 5'-cytidylate, 2',3'-adenylate, guanylate, and 2',3'-cytidylate during fermentation, while it showed little change toward 5'-uridylate, 2',3'-uridylate, sugar phosphates, β-glycerophosphate, p-nitrophenyl phosphate. The substrate specificity of I as N-ribosidases broadened during fermentation. Only adenosine was not acted upon by I. In all the stages of fermentation the I was most active toward 5'-inosinate.

CA, V. 72, 1970: 53845x

FUJISHIMA, T.; CHIBA, H.; et al.

Phosphatase in shoyu. III. Improved method for assay of phosphatase activity in shoyu. Chomi Kagaku 1967, 14(6), 1-6 (Japan).

Among colorimetric methods for detg.-phosphoric acid the method of R.J.L. Allen (1940) was adopted. The colored product, however, was dissolved in iso-BuCOMe (I) according to D.N. Rhodes (1955), after comparison of solvents such as BuOH and amyl alc. The absorption max. of molybdenum blue (II) in I, BuOH, and amyl alc. was 720, 740 and 740 mμ, resp. The absorption max. for I was the most distinctive. Also the stability of II was greatest for I. The principle of the new method proposed is as follows. Remove NaCl, H_3PO_4 , and a part of coloring matter from shoyu by dialysis. Perform the enzymic reaction with IMP as the substrate and the inner soln. of dialysis as the enzyme soln. React the H_3PO_4 liberated from the substrate by phosphatase in shoyu by the Allen method. Transfer the formed II into I by the Rhodes method. Add anhyd. Na_2SO_4 to remove H_2O. Det. inorg. PO_4^{3-} from the absorbance at 720 mμ. Make a blank test with H_2O instead of the enzyme soln. as this process decomp. a small part of the substrate. Calc. phosphatase activity from the amt. of PO_4^{3-} formed by the enzymic reaction minus that of PO_4^{3-} liberated by decompn. of the sub-

strate. This detn. is important, because IMP and (or) GMP is often added to shoyu for enhancing the flavor.
CA, V. 73, 1970: 33925r

FUJISHIMA, T.; CHIBA, H.; et al.
Phosphatase in shoyu. IV. Properties of phosphatase produced by yeasts in shoyu. (Yamasa Shoyu Co., Noda, Japan). Chomi Kagaku 1968, 15(3), 1-9 (Japan).

The yeasts examd. were Torulopsis famata, Pichia farinosa, and Candida polymorpha as found in the initial stage of shoyu fermentation, Saccharomyces rouxii and S. acidifaciens as found in the middle course of fermentation, T. versatilis and T. halophila as found in the final stage of fermentation, and Aspergillus oryzae No. 13 as the control. Formation of phosphatase was low (less than 10^{-3} unit/ml) in general, except in P. farinosa (10.8×10^{-3} unit/ml) and in A. oryzae (50.3×10^{-3} unit/ml). Optimum pH and temp. as well as substrate specificity of phosphatases of yeasts varied in the course of fermentation.
CA, V. 73, 1970: 33988p

FUJISHIMA, T.; CHIBA, H.; et al.
Phosphatase in shoyu. V. Properties of phosphatases produced by bacteria in shoyu. (Yamasa Shoyu Co., Noda, Japan). Chimi Kagaku 1968, 15(5), 6-14 (Japan).

Bacteria examd. were Bacillus subtilis, B. natto, B. mesentericus, Micrococcus varians, Staphylococcus epidermidis, Pediococcus soyae, and P. halophilus. Among them B. mesentericus produced 10.61×10^{-3} unit/ml phosphatase (I). The others produced 3.0×10^{-3} unit/ml or less. I changed is optimum pH and temp. and substrate specificity during brewing of shoyu.
CA, V. 73, 1970: 44056j

FUJISHIMA, T.; SUZUKI, M.; et al.
Phosphatase in soy sauce. VII. Effects of surface-active agents on phosphatases. (Yamasa Shoyu Co., Choshi, Japan). Chomi Kagaku 1969, 16(3), 14-20 (Japan).
Flavorous nucleotides such as IMP and GMP may be hydrolyzed by phosphatases present in foods. The latter in soy sauce could be inactivated by heating. However, too much heating is not desirable. This paper reports the beneficial effect of surface active agents in lowering the temp. of inactivating phosphatases of shoyu. Among the agents, Nonion S-220 was the most effective in inactivating the shoyu phosphatase by heating. The inhibitory action in the enzymic reaction of phosphatase was great with comp. cationic agents, F_2-50 and Esomin C-12, and the anionic agent, Sintorex LD-40. Against alk. phosphatase, effective inhibitors were cationic agents, AB, FB, and F_2-50, the anionic agent, Sintorex LD-40, and the amphoteric agent, Anon LG.
CA, V. 73, 1970: 43982w

HAGA, H.; SUGAWARA, T.
Experimental shoyu brewing by use of an actinomycetal enzyme. II. Use of the pile carrier incubation. (Sendai Miso Shoyu Co., Sendai, Japan). Chomi Kagaku 1967, 14(2), 1-15 (Japan).

The raw materials were defatted soybean meal and wheat (5.5:4.5). The actinomycetal enzyme, Prozyme, was added at 0.3 or 0.5%, and the mixt. was kept at 55° for 3 or 21 hrs. Further brewing was made at 28° after adding water and NaCl. The course of shoyu brewing was followed by detg. NaCl, total N, ammonia N, reducing sugars, EtOH, pH, acidity, and absorbances at 470, 530, and 610 mμ. The use of Prozyme was not beneficial.
CA, V. 71, 1969: 69440b

HANAOKA, Y.
Preservation of soy sauce. I. The esterase produced by Aspergillus soya. (Noda Shoyu Co., Chiba, Japan). Hakko Kogaku Zasshi 1962, 40, 610-4.

Decompn. of Bu p-hydroxybenzoate in raw soy sauce was due to the action of an enzyme produced by A. soya. It was an esterase which had no synthetic or benzene nucleus-cleaving activity. The optimum pH of the enzyme was 6.0. Of a no. of compds. examd., Na laurysulfate, p-hydroxybenzoic acid, eserine, L-ascorbic acid and benzaldehyde inhibited the enzyme, but ETDA did not H_2O_2 had no action on the enzyme at all. It was inhibited by NaCL which had a protecting effect against heat. The enzyme was inactivated by 10 min. at 50° in the absence of NaCl. The enzyme acted similarly on the Me, Et, Pr, and Bu esters of p-hydrobenzoate.
CA, V. 62, 1965: 16877b

HASHIBA, H.
Nonenzymic browning of soy sauce. Comparison of the browning of soy sauce with that of sugar-amino acid model system. (Noda Inst. Sci. Res., Noda, Japan). Agr. Biol. Chem. 1972, 36(3) 390-7 (Eng).

The browning reaction soy sauce (I) was compared with that in a model system contg. sugars (glucose, 4%; xylose, 1%) and amino acids (glycine (II), 5%; glutamic acid (III), 5%). In both cases, browning was developed on heating or static oxidn. (spontaneous oxidn.). On shaking oxidn. (obliged oxidn.), on the contrary, browning was obsd. only in I; in the model system, it was repressed by this treatment. The brown pigments in the model system were fractionated into 2 components, designated F-A and F-B, by gel filtration on Sephadex G-25. The amt. of F-A was increased on oxidn., and that of F-B was increased on heating but decreased on oxidn. The color of F-A was dark and that of F-B was light. F-A and F-B were suggested to be analogs to brown pigment P-I and P-III in I, resp., judging from the results of gel filtration, characteristics of the color, and uv absorption spectra. Amino acid solns. (hydrolyzates of soybean) resembled I more closely than the model system in the browning behaviors on shaking oxidn. and in chromatog. patterns of brown pigments on Sephadex G-25. In addn., not only II and III but also many other amino acids were lost during the browning of I.
CA, V. 77, 1972: 33012y

HASHIBA, H.

Nonenzymic browning of soy sauce. IV. Effect of aging on the oxidative browning of sugar-amino acid model systems. (Noda Inst. Sci. Res., Noda, Japan). Agr. Biol. Chem. 1974, 38(3), 551-5 (Eng).

Sugar-amino acid model systems were aged for 3 months under anaerobic or aerobic conditions. Subsequently, these aged model systems were stored for 2 weeks at 37° under aerobic conditions to examine oxidative browning. The oxidative browning of the model systems increased with increasing aging. Fe^{2+} increased the effects of the aging. The model systems aged under anaerobic conditions darkened more than those aged under aerobic conditions during storage for 2 weeks. An Amadori rearrangement product, 1-deoxy-1-glycino-D-fructose was isolated from the aged glucose-glycine model system and it caused a marked increase in the rate of the oxidative browning. Amadori rearrangement products are considered to be important precursors in oxidative browning.
CA, V. 81, 1974: 62376h

HSU CHENG

Comparative studies on the mixing fermentation of soy sauce prepared from different cultures of Aspergillus. (Joint Ind. Res. Inst., Taipei). J. Agr. Assoc. China (Taiwan) 1963, 43, 52-5 (Ch).

With single fermentation, Aspergillus YT 2-3 gave the best soy sauce of excellent flavor, whereas Chung type Aspergillus was superior in proteolytic effect for mixed fermentations. The natural fermented soy product is of better quality than that inoculated with selected organisms. A 1:1 mixt. of soybean and wheat was used for all fermentations.
CA, V. 66, 1967: 84735s

HYUN, K.J.; SIN, K.R.; et al.

Studies on the fermentation of soy sauce by bacteria. Kor. J. Food Sci. Technol. 1972, 4 (4), 276-284

A strain of Bacillus sp. which has powerful enzymatic activity and sets free a little amount of ammonia and large amount of amino nitrogen was separated from Meju, Denzang, Chungkukjang, and paddy straw to make the soy-sauce rapidly and conveniently in the various mixing ratio of steamed soy-bean and wheat parched or steamed. Total nitrogen and amino nitrogen were increased during the maturing. The acidity of soy-sauce was increased to 1.15-1.98% than ordinary soy-sauce. pH were ranged in 4.6-6.0. The fermenting time takes 30 days while it takes at least 4 months by the ordinary method. The best results were obtained with the mixed ratio of 1:1 or 1:2 (wheat-soybean).
Korean Sci. Abstr., V. 5 (1) 1973: 133.

ICHIKAWA, K.

Soy manufacture by enzymic method. I. Selection of a submerged culture method suitable for soybean digestion by Aspergillus. (Kyoto Univ.). J. Fermentation Technol. (Japan) 1954, 32, 379-84.

Soy sauce manuf. by submerged culture under nonsalty condition has been studied to attain ripening in a shorter period. The solid koji process was superior to shake culture and aeration culture in obtaining great proteolytic activity. The proteolytic activity of surface (semisolid) culture was nearly equal to that of the solid koji. The use of 0.25% HCl as feed water decreased the viscosity of the mash.
CA, V. 49, 1955: 2025a

ICHIKAWA, K.
Soy manufacture by enzymic method. II. Surface culture and production of protease by submerged culture. (Kyoto Univ.). J. Fermentation Technol. (Japan) 1954, 32, 501-6; cf. CA 49, 2025a.

A few strains of Aspergillus were selected which were suited for surface culture on a semisolid medium. With these strains, the optimum digestion temp was 40-5°. To shorten the culture period it was required to prolong the digestion period; usually 6-7 days was required for utilization of raw material by the molds. $CaCO_3$ did not augment the proteolytic activity of the molds. The max. amt. of NaCl permissible for addn. to the culture medium was 2.5%. By shaking the liquid culture, more mold protease was produced on the natural media than on the synthetic media, but the best yield was not greater than the yield on solid medium.
CA, V. 49, 1955: 8551b

ICHIKAWA, K.
Soy manufacture by the enzymic method. III. Estimation of glutamic acid by buffered paper chromatography. (Kyoto Univ.). J. Fermentation Technol. (Japan) 1955, 33, 6-8; cf. C.A. 49, 8551b

In the usual paper chromatography the spot of glutamic acid on a one-dimentional chromatogram is not sepd. sufficiently from the spots of other amino acids, especially of serine. Use of the pH 10 buffer mixt. of McFarren (C.A. 45, 3447e) effected this sepn. excellently. Glutamic acid was detd. by estg. the area of the spot on buffered paper chromatogram. When soybean cake was digested partially with 0.25% HCl under pressure for 20 min. and seeded with soy koji for surface culture for 7 days followed by digestion at 43° for 6 days, the amt. of glutamic acid liberated at the end of the surface-culture period was 7.2% and after digestion it was 30%. This change nearly paralleled the changes of sol. N and amino N. Presence of NaCl, particularly above 4%, greatly interfered with the detn. of glutamic acid by this method.
CA, V. 49, 1955: 13584h

ICHIKAWA, K.
Soy manufacture by enzymic method. IV. Peptides in soy sauce. (Kyoto Univ.). F. Fermentation Technol. (Japan) 1955, 33, 198-9; cf. C.A. 49, 13584h.

In the prepn. of soy sauce, 30 g. soybean cake was digested in 120 cc. 0.25% HCl at 8 lb./sq. in. pressure for 20 min., incubated with soy-koji (No. 21 strain) for 7 days, and digested further at

43° for 4 days. The mixt. contained 75.8% sol. N and 40.4% amino N; the pH was 6.4. This soy sauce showed, on paper chromatogram, aspartic acid, glutamic acid, serine, threonine, phenylalanine, proline, lysine, arginine, histidine, methionine, and tryptophan, together with peptides consisting of glutamic acid, aspartic acid, glycine, alanine, leucine, and (or) valine. The significance of these peptides on the taste is discussed.

V. Autolysis by solid culture and ripening of the digested product. Ibid. 200-2.
Soybean cake (10 g.) with 6 cc. water was cultivated with No. 21 koji for 64 hrs. at 30° and then, after addn. of 50 cc. water, was digested at 43° for various periods by autolysis . Sol. N, amino N, and glutamic acid rapidly increased in the initial 4 days, the glutamic acid increasing at a rate faster than by fermentation. The taste was not effected by using various strains of solid koji. The addn. of a small amt. of wheat to the starting material or the addn. of fermented soybean after some ripening gave very excellent flavor to the products by the above process.
CA, V. 49, 1955: 15162i

ICHIKAWA, K.
Soy manufacture by enzymic method. VII. Utilization of the raw material. (Kyoto Univ.). J. Fermentation Technol. (Japan) 1955, 33, 285-7; cf. C.A. 49, 15162i

The utilization rate of soybean cake in the nonsalt fermentation process for manufg. soy sauce was compared with that in usual fermentation process. The nonsalt process was performed by cultivating Aspergillus oryzae (No. 21 strain) on 100 g. soycake, digesting after addn. of 400 cc. water for 4 days at 43°, and dilg. to make 1 l.; ripening was made by leaving the digested mixt. for 2 weeks at 20-8° after addn. of ordinarily fermented mash and NaCl. The utilization rates of various components of soycake by the nonsalt process and ordinarily fermented process were: org. matter 68.7, 38.9%; crude protein 75.3, 59.5; carbohydrate 25.4, 28.7; crude ash 79.9, 60.3; NaCl 85.7; 88.1; glutamic acid 32.4, —; thiamine 77.6, 10.0. Higher utilization rate of materials by the nonsalt process was suggested to be due to the fact that absence of NaCl in the fermentation stage did not inhibit necessary enzymic actions as did NaCl in the ordinary process.

VIII. Organic acids. Ibid. 288-90.

The soy sauce produced by nonsalt process contained 0.07-0.11% succinic acid occupying 8-14% of total nonvolatile acids contained, and in this regard it was not inferior to ordinarily produced soy sauce. Succinic acid was suggested to derive from carbohydrate in soycake but not from AcOH through polymerization, nor glutamic acid through oxidation. By paper chromatography succinic, lactic, malic, citric, oxalic, and kojic acids were detected; gluconic acid appeared to be present also. Lactic acid was contained in the largest proportion among other org. acids.
CA, V. 49, 1955: 16323i

IITUKA, K.; GOAN, M.

L-Arginine decomposition in soy sauce mash. (Res. Lab., Choshi Shoyu Co., Ltd., Choshi, Japan). Chomi Kagaku 1973, 20(5), 17-24 (Japan).

Decompn. of arginine [74-79-3] in soy sauce mash during fermn. was investigated by using various bacteria and yeasts. Among the 16 strains of bacteria and yeasts used, Aspergillus oryzae, Pediococcus soyae, and Bacillus produced arginine-decompg. enzymes but their activity differed greatly between the strains. Bacillus produced an extracellular enzyme and ornithine accumulated in the medium, however, P. soyae produced an intracellular enzyme which was incorporated into the cells as ornithine. Micrococcus species and yeasts were not able to decompose arginine.
CA, V. 83, 1975: 176909f

ITO, H.; EBINE, H.

Microflora in soysauce mash made from roll-pressed wheat. (Food Res. Inst., Tokyo, Japan). Shokuryo Kenkyusho Kenkyu Hokoku. 1968, (23), 23-5 (Japan).

The quality of microflora in koji and soysauce mash made from roll-pressed steamed wheat were compared with those obtained by the usual procedure using roasted wheat. Greater nos. of haloresistant Micrococcus and Clostridium were found in the former, and the flavor of the former was poorer than in the latter. Less reducing sugar and more alcs. and acids were present in the former, while no difference in H_2O-sol. and amino N content was found between the 2.
CA, V. 69, 1968: 42882u

IWASHITA, H.

Making soy sauce from a crude protein hydrolyzate. I. (Govt. Inst. Brewing, Tokyo). J. Soc. Brewing, Japan 1952, 47, 390-2.

A crude protein hydrolyzate (I) of wheat or soybeans, obtained as the by-product of Na glutamate manuf., contained come substances, of unknown chem. nature, that inhibited fermentation; these were sepd. by adsorption with acid clay from acidic soln. and elution with an aq. alk. soln.

II. Ibid. 1953, 48, 432-7

Fermentation with Aspergillus and yeasts was effective for deodorization, and produced a shoyu-like flavor from I. Fermented mash of I resulted in high quality soy sauce by addn. of 30-50% natural mash, or of 0.05% succinic, 0.1% lactic, and 0.05% acetic acids.

III. Semi-commercial experiments on suspension brewing. Haru-hichi Iwashita, Matsuji Ishiyama, and Kenji Sato. Ibid. 1954, 49, 465-7.

A purified I was fermented by Zygosaccharomyces major koji suspended in a basket. Chem. constituents of koji eluted more rapidly in suspension brewing than in mash brewing. Fermentation and ripening of flavor were also rapid in the suspension process. Activities of amylase and protease of mash were highest at upper portion, medium at bottom, and lowest at the middle of the fermenting app. When

the temp. was controlled at 26-8° during the whole period of brewing, comparatively superior soy sauce was obtained, but at 35° the fermentation was incomplete. When the temp was controlled at 15° for 10 days, 22-3° for 25 days, 33-8° for 10 days, 40-5° for 7 days, and at room temp. thereafter, the best soy sauce was produced.
CA, V. 50, 1956: 1260de

JU, H.K.; RO, S.K.; et al.
Studies on the fermentation of soy sauce by bacteria. Kor. J. Food Sci. Technol. 1972, 4(4), 276-84, 9 Fig. 10 Tab. 28 Ref.

A strain of Bacillus sp. which has powerful enzymatic activity and sets free a little amount of ammonia and large amount of amino nitrogen was separated from Meju, Denzang, Chungkukjang, and paddy straw to make the soy-sauce rapidly and conveniently in the various mixing ratio of steamed soy-bean and wheat parched or steamed.Total nitrogen and amino nitrogen were increased during the maturing. The acidity of soy-sauce was increased to 1.15-1.98% than ordinary soy-sauce. pH were ranged in 4.6-6.0. The fermenting time takes 30 days while it takes at least 4 months by ordinary method. The best results were obtained with the mixed ratio of 1:1 or 1:2 (what : soy-bean).
Korean Sci. Abstr., V. 5, 1973: 133

JU, H.K.; RO, S.K.; et al.
Fermentation of soy sauce by bacteria. (Coll. Agric., Kon-Kuk Univ., Seoul, S. Korea). Han'guk Sikp'um Kwahakhoe Chi 1973, 4(4), 276-84 (Korean).

A strain of Bacillus species which has powerful enzymic activity and releases a small amt. of NH_3 and a large amt. of amino N was used to make soy sauce from various ratios of steamed soybean and parched or steamed wheat. Total N and amino N increased during maturing. The acidity of soy sauce increased 1.15-1.98% over ordinary soy sauce, the pH ranging from 4.6 to 6.0. The fermn. took 30 days while it takes at least 4 months by the usual method.
CA, V. 79, 1973: 113968w

KAKEDA, R.; TANIGAWA, Y.; et al.
Soy sauce manufacturing methods using enzyme preparations. II. Manufacturing experiment of soy sauce using protease preparations in the pilot plant. (Kagawa Ken Ferment. Food Exp. Stn., Takamatsu, Japan). Chomi Kagaku 1971, 8(6), 233-8 (Japan).

Natural protease prepns. produced by Bacillus subtilis were used for hydrolysis of soybean proteins. Soybean cake 200 was sprayed with H_2O 240 parts and cooked for 30 min under a pressure of 1 kg/cm^2 to be hydrolyzed with 500 parts enzyme soln. for 5 hr at 55°. The amt. of enzyme was 1.5% of the amt. of soybean cake. Adjusting the pH of the mash was not necessary. The rate of H_2O-sol. N/total N of the hydrolyzed mash was 0.75, which was elevated to 0.82 after fermen. for 3 months.
CA, V. 80, 1974: 93454v

KATO, H.; YOSHII, H.

Microbiology of vegetables soaked in soy sauce. II. Sorbic acid tolerance of main microorganisms. (Aichi Food Ind. Expt. Sta., Nagoya, Japan). Nippon Shokuhin Kogyo Gakkaishi 1966, 13(4), 137-40 (Japan); cf. preceding abstr.

The growth of Lactobacillus plantarum, Streptococcus faecalis, and Micrococcus varians in a soaking soy sauce contg. 10% NaCl at pH 5.0 was retarded by 0.001% sorbic acid, but the growth of some strains of S. faecalis and M. varians was not retarded. When pH of a soaking soy sauce was lowered to 4.6, the growth of tolerant S. faecalis and M. varians was retarded by 0.001% sorbic acid.
CA, V. 65, 1966: 15978h

KAWASAKI, H.

Fermented food. Japan. 172,807, May 31, 1946.

Soybeans are cooked and fermented with Aspergillus for saccharification and protein digestion. When the mash turns to putrefying or acids formation, it is pasteurized at 70°, inoculated again to proceed with hydrolysis, and this process is repeated until the proteins reach an easily digestible state. The food is sterilized, and made into solid or paste form.
CA, V. 46, 1952: 2205a

KIBI, M.

The varieties of Aspergillus oryzae employed in the manufacture of shoyu (soy sauce). III. Amylase and protease. (Yamasa Shoyu Co., Chiba-ken). J. Agr. Chem. Soc. Japan 1951, 24, 278-81; cf. C.A. 33, 5983^5

Eight varieties were tested for amylolytic and proteolytic activities. Variety no. 6 had the lowest amylolytic activity, while variety nos. 3, 6, 10, and 13 had very high proteolytic activity, which is desirable for shoyu manuf. Variety no. 6 was identified as Aspergillus sojae of Sakaguchi and Yamada (J. Agr. Chem. Soc. Japan 1944, 20, 64)
CA, V. 46, 1952: 7170e

KOBATA, Y.

Mold-preventing action of α-hydroxycapric acid in soy. J. Agr. Chem. Soc. Japan 1935, 11, 789-90.

The mold preventing action of α-hydroxycapric acid is much less than that of capric acid. The action of the acetyl deriv. is similar to that of α-hydroxycapric acid.
CA, V. 30, 1936: 3015^6

KOMATSU, Y.

Changes of some enzymie activities in shoyu brewing. I. Changes of the constituents and enzyme activities in shoyu fermentation after low-temperature mashing. (Prefect. Food Ind. Expt. Sta., Hiroshima, Japan). Chomi Kagaku 1968, 15(2), 10-20 (Japan).

Comparison was made between the shoyu fermentation after mashing at lower (10 or 15°) and higher (25°) temps. In general, low-temp.

mashing gave better results. There was no remarkable difference between mashing at 10 and 15°, but mashing at 10° gave better results concerning L-glutamic acid content of the final product. Low-temp. mashing prevented the lowering of pH at initial period of fermentation. This stability of pH (6.0-5.5 is desirable) was considered to be the cause of higher amts. of L-glutamic acid, total N, and formol-reactive N. The remaining sugar after 180 days of fermentation was similar in amts. between low- and high-temp. mashings. Deactivation of protease and amylase was lower in case of low-temp. mashing; thus, these enzyme activities remained longer. Neutral and alk. protease activities changed more than acid protease activity by deactivation. Amylase activity changed no more than neutral and acid protease activities.
CA, V. 73, 1970: 33987n

KOMATSU, Y.
Changes of some enzyme activities in shoyu (soy sauce) brewing. II. Influence of low temperature on the changes in dissolved components and enzyme activities during shoyu fermentation by low temperature mashing. (Prefect. Food Ind. Expt. Sta., Hiroshima, Japan). Chomi Kagaku 1969, 16(4), 7-14.

The duration of low-temp. mashing at 10° was 15, 30, or 60 days. The mash was aged at 25° for 180 days. The product soy sauce had the best quality after holding at 10° for 60 days. This was detd. by higher production of L-glutamic acid, total N, and formol N, and higher remaining activities of protease and amylase. The changes in activity were greater for neutral and alk. proteases and less for acid protease and amylase.
CA, V. 73, 1970: 43985z

KUBICEK, J.
Protein decomposition in soybeans fermented with Aspergillus oryzae. Tech. Publ. Stredisko Tech. Inform. Potravinar. Prumyslu 1956-61, (161), 93-6 (Pub. 1962).

Fermentation of soybeans by A. oryzae, important for food production in the Far East, was studied. Peeled beans were soaked in H_2O for 24 hrs., boiled for 50 min., spread on Petri dishes and inoculated with the mold culture. In a few days mycelium and substrate formed a semi-solid material which was homogenized and analyzed for free NH_3 (I), free NH_2 groups (II), and free amino acids. Max. increase of I was found at the 8th day of the incubation. Protein hydrolysis (as judged from II) was highest after 10-11 days. The amino acids are liberated in a characteristic sequence. A part of the glutamic acid was liberated 1st; the max. free arginine (2.23%) was found at the 8th day, of glutamic acid (3.9%) and of aspartic acid (1.4%) at the 11th day. Cystine and histidine are partly decomposed by the mold.
CA, V. 60, 1964: 7368h

KUBOTA, K.; HIDAKA, F.; et al.
Application of a commercial enzyme preparation to soy sauce making. (Ueda Chem. Ind. Co., Ltd., Neyagawa, Japan). Chomi Kagaku 1975, 22(3), 13-21 (Japan).

Defatted soybeans were digested by adding 1.5-2.0% of the enzyme Tanabe. The digested matter was mixed with koji for mashing. When compared with the conventional method, this procedure improved the percentage of extd. N by 7-8% without differences in amino acid compns. of the products. After pasteurization, both flavor and color were satisfactory.
CA, V. 83, 1975: 191477g

KUNINAKA, A.
Shoyu manufacture. (Yamasa Shoyu Co., Choshi, Japan). Chomi Kagaku 1967, 14(4), 42-53 (Japan).

An address. Topics include the production and control in the flora of shoyu mash, the system of RNA biosynthesis, the structure and flavor of nucleotides. RNase, the roles of RNA and DNA in life processes, and self-reproduction and self-control in bacteriophages.
CA, V. 72, 1970: 53775z

KUROSHIMA, E.; OYAMA, Y.; et al.
Effect of microorganisms on the biosynthesis and degradation of glutamic acid in the brewing of soy sauce. 3. Factors affecting the glutamic acid and related substance formation in the brewing of soy sauce. (Res. Inst., Marukin Soy Sauce Co., Japan). Hakko Kogaku Zasshi 1969, 47(11), 693-700 (Japan).

In early stages of the brewing, both glutamic acid and glutamine are liberated from raw materials via peptides by the action of fungal proteases. Glutamine thus liberated is rapidly converted to glutamic acid by glutaminase action of shoyu-koji providing the pH of mash is between 6.5 and 7.5. The nonenzymic formation of pyroglutamic acid from glutamine, however, is predominant at pH ∿4.5. Free glutamic acid is also gradually converted to pyroglutamic acid nonenzymically, depending on the temp. and acidity of the soy sauce mash.
CA, V. 72, 1970: 77607x

LEE, K.H.; SONG, S.H.; et al.
Koji for soy sauce brewing. III. The production of protease, amylase, and vitamins by uv-induced mutants of Aspergillus oryzae. Kisul Yon'guso Pogo 1963, 2, 26-31 (Korean)

The enzyme-producing potentials of industrially important strains of Aspergillus were studied. Uv-irradiation of 3 original isolates of A. oryzae resulted in the production of mutants which differed from the parent in the production of riboflavine and vitamin B_{12} in culture media. Irradiation of 3 strains of A. oryzae with uv light produced mutants; 2 strains were selected for soy sauce brewing. A. oryzae uv-induced mutants, 172-722 and 569-713 produced the most riboflavine and vitamin B_{12}. The enzyme activity of these strains was high and was decreased only slightly in 20% NaCl. Mutant 172-722 produced more protease in wheat bran media than in modified Czapek's soln.; mutant 569-713 produced more amylase in modified Czapek's soln. than in mold bran. Mutant 172-722 formed spores rapidly, and mutant 569-713 formed spores at

the normal rate. Mutant 172-722 is a valuable material for the manufacture of soy sauce because of its high protease activity in 20% NaCl. Mutant 569-713 is suitable for soy bean mash and for fermented red pepper sauce because of its high amylase activity in 20% NaCl.
CA, V. 65, 1966: 1308d

LEE, T.S.; LEE, S.K.
Studies on the yeast for the brewing of soy sauce. I. Isolation, identification and classification of the yeasts in the soy sauce koji. J. Kor. Agr. Chem. Soc. 1970, 13(1), 97-103. Tab. 4 Ref. 48.

This experiment was carried out to investigate the yeasts for the brewing of soy sauce. The yeasts in the soy sauce koji were isolated and identified. And they were classified by coloring with the treatment of TTC (2,3,5 triphenyltetrazolium chloride) agar and counted.
The results obtained were as follows:

1. The number of the yeasts in the koji was increased in process of incubation time: about 97 x 10^3 per gram of koji incubated for 3 days, 135 x 10^3 4 days and 179 x 10^3 5 days.
2. They were classified as 53.6-71.9 per cent of TTC white yeasts for the most, 5.6-11.1 per cent of red yeasts, 6.8-19.5 per cent of red yeasts and 11.1-22.6 per cent of pink yeasts.
3. 30 strains of yeasts were isolated from the koji optionally, and they were identified as 6 genera and 21 species: 5 strains of Saccharomyces rouxii, 2 strains of Saccharomyces fermentati, 1 strain of Saccharomyces rosei, 6 strains of Saccharomyces rosei, 6 strains of Hansenula anomala, 2 strain of Hansenula soaveolens, 6 strains of Pichia polymorpha, 2 strains of Devaryomyces nicotianae, 2 strains of Torulopsis candida 2 strains of Torulopsis sake and 2 strains of Torulopsis sake and 1 strain of Candida pelliculosa.
4. The yeasts belonging to Hansenula soaveolens, Hansenula anomala Candida pelliculosa, Debaryomyces nicotianae and Pichia polyjorpha were classified as TTC white yeasts, Saccharomyces rouxii and Saccharomyces rosei were red, Saccharomyces fermentati and Devaryomyces hancenii were red pink, and Tourulopsis cadida and Torulopsis sake were pink.
5. Generally the growth of the yeasts isolated were rapid on the media containing none or 10 per cent of sodium chloride but almost restrained on the media containing 15-18 per cent of sodium chloride.

Korea Sci. Abstr., V. 2, 1970: 725

LEE, T.S.; LEE, S.K.
Studies on the yeasts for the brewing of soy sauce. III. Isolation and identification of osmophilic yeasts for higher concentration of NaCl. J. Kor. Agr. Chem. Soc. 1970, 13(3), 187-91. Tab 5 Ref. 10.

This experiment was carried out to isolate osmophilic yeasts for higher concentration of NaCl than 20 percent may affect greatly the fermentation of soy sauce. 6 strains of yeasts were selected from the soy sauce mashes at the fermentating periods and were identified by observing their morphological characteristics. Their salt-resistance and effects upon the flavor of soy sauce were examined. The results obtained were as follows:

(1) The strain T_3, T_5, and T_{11}, T_8, T_9, and T_{10}, selected were identified Saccharomyces cerevisiae group II, Debaryomyces nicotianae, Saccharomyces chevalieri, Saccharomyces rouxii and Saccharomyces rosei, respectively.
(2) They were more salt-resistant on the liquid media than on the solid media in the case of cultures on the media containing more than 26 percent of NaCl.
(3) They were grown on the media containing 5-23 percent of NaCl better than containing none of NaCl.
(4) The strain T_3, T_8, T_9, and T_{10} were grown on the media containing up to 28 percent of NaCl, and T_5 and T_{11} up to 32 percent of NaCl in the case of liquid cultures.
(5) Among them, the strain T_9 showed the best alcohol fermentation ability and the best fermentative flavor, and T_5, and T_{11} formed moldy small and pellicle.
Korean Sci. Abstr., V. 3, 1971: 537

LEE, T.S.; LEE, S.K.
Studies on the yeasts for the brewing of soy sauce. IV. Cultural conditions of the osmophilic yeasts for higher concentration of NaCl. J. Kor. Agr. Chem. Soc. 1970, 13(3), 193-5. Tab. 4 Ref. 6.

The cultural conditions of the osmophilic yeasts for higher concentration of NaCl selected in the previous report were examined and the results obtained were as follows:

1) The strain T_3 and T_8 were grown exceedingly well on the media containing 15 percent of NaCl and T_5, T_9, T_{10} and T_{11} on the media containing 5 percent of NaCl.
2) The optimum temperature for growth of the strain T_3 and T_5 was 30°C, T_8 T_{10} and T_{11} was 25°C and T_9 was 35°C.
3) Their lethal temperature was 60°C (treatment for 10 minutes).
4) The optimum pH for growth of the strain T_3 and T_8 was pH 4.0, T_5 was pH 6.0 and T_9, T_{10} and T_{11} was pH 5.0, respectively.
Korea Sci. Abstr., V. 3, 1971: 538

LEE, T.S.; LEE, S.K.
Studies on the yeasts for the brewing of soy sauce. V. Nutritional requirements of Saccharomyces rouxii T-9.(1). Influence of addition of nitrogen sources and inorganic salts. J. Kor. Agr. Chem. Soc. 1971, 14(1), 99-102. Tab. 2 Ref. 6.

These experiments were conducted to study the effects of various nitrogen sources and inorganic salts upon the growth of Saccharomyces rouxii T-9, and the results obtained were as follows:

1) The strain showed the most rapid growth in the case of 2.5 to 5.0% addition of peptone as an organic nitrogen source, and 1.0% addition of $(NH_4)_2HPO_4$ as an inorganic nitrogen source respectively to the media containing no NaCl.
2) Its growth was the most rapid in the case of 1.5% addition of yeast extracts as an organic nitrogen sources, and 5% addition

of urea as an inorganic nitrogen source respectively to the media containing 20% of NaCl.

3) Its growth was the most rapid in the case of 1% addition of $NaNO_3$ as an inorganic salt to the media containing no NaCl, while to the media containing 20% or 26% of NaCl its growth was more rapid in the case of 5% addition of $NaNO_3$than 1% addition.
4) Its growth was more rapid in the case of 0.5% addition of $MgSO_4$ and $CaCl_2$ respectively to the media containing 20% of NaCl than to the media containing no NaCl, and was rapid in the case of 1% addition of $MgCl_2$ to the media containing 26% of NaCl.

Korean Sci. Abstr., V. 3, 1971: 540

MACHI, N.

Comparative studies of soybean mashes during natural and heated brewing. Changes of constituents and microflora of soybean mashes during ripening. (Cent. Miso Inst., Mie, Japan). Chomi Kagaku 1966, 13(3), 1-16 (Japan).

Changes of microflora, enzyme activities (proteases and amylase), and various chem. constituents in soy mashes during soy sauce fermentation were compared between the routine process and fast-brewing process. There were no significant differences in overall properties of the products detected in the 2 processes, and under proper control of temp., and hence of microorganisms, better quality products could be obtained in shorter periods by fast-brewing than by the routine way.
CA, V. 70, 1969: 18998m

MAING, I.Y.; AYRES, J.C.; et al.

Persistence of aflatoxin during the fermentation of soy sauce. (Food Sci. Dep., Univ. Georgia, Athens, Ga.). Appl. Microbiol. 1973, 25(6), 1015-7 (Eng.)

Aflatoxin was produced by Aspergillus parasiticus NRRL 2999 but not by A. oryzae during soy sauce fermn. Little aflatoxin was degraded within 6 weeks unless Lactobacillus delbrueckii was also present.
CA, V. 79, 1973: 51810c

MATSUSHIMA, K.

Proteolytic enzymes of molds. V. Proteolytic activities of commercial strains of Aspergillus flavus-oryzae group. 1. (Mie Univ., Tsu-City). J. Fermentation Technol. (Japan) 1954, 32, 14-9; cf. C.A. 48, 5916f.

Many strains employed for production of soy sauce, soy paste, sake, and spirits were compared for proteolytic activity by gelatin-liquefying, casein-digestion, and milk-agar-digestion methods. As detd. by the gelatin-liquefying and casein-digesting methods, the ratio of the proteolytic activities of extreme strains was 7:1. It was found that the strains usually employed in spirit manufg. were inferior to other strains in proteolytic activity and those employed in soy-sauce manufg. showed marked superiority to others in gelatin-liquefying activity.
CA, V. 48, 1954: 10833d

MOGI, K.

Soy-sauce production by submerged culture. I. Selection of suitable strains for the production of proteases in submerged culture. (Kyoto Univ.). Kogaku Zasshi 1958, 36, 87-90.

Strains of Aspergillus oryzae were selected which produced considerable protease in modified Dworschack medium and in 5% wheat-bran medium. The protease production by these microorganisms was not parallel in liquid and in solid cultivating media. Shaking culture gave larger protease production than did static culture, indicating that the production is independent of spore formation.

II. Selection of the media for the protease production. Ibid. 91-5.

The best liquid medium for high protease production from the above fungi for soy-sauce manufg. contained 2% wheat-bran and 0.5% defatted soybean meal. No relation was found between the C/N ratio in the medium and the productivity of protease. Addn. of $CaCO_3$ to the medium decrease the protease production. In shaking cultivation, 2.5-3.5% total solids was best for the protease production. Cultivation under aeration and agitation gave results smimilar to that of shaking cultivation.

III. Enzymic decomposition of cooked soybean by submerged koji. Ibid. 125-8.

Cooked, defatted soybean was aseptically and in the absence of NaCl decompd. by the protease soln. abtained by filtration of the submerged culture of the above-selected A. oryzae. When the fungus was allowed to propagate in the enzymic decompg. soln. of soybean, a large amt, of ammonia N was produced with consequent development of unpleasant odor. Toluene was recommended to inhibit the microbial propagation. Under these conditions, the enzyemic digestion was complete in 8-10 days, giving the total N and amino-N contents equiv. to the soln. digested by ordinary fermentation for 1 year; the utilization rate of the N compds. in the starting material was above 80%. The digestion with submerged koji gave rise to very small formation of amino N. Addn. of high concns. of NaCl inhibited considerably the enzymic digestion of the cooked soybean and decreased the N utilization and amino-N formation rates.

IV. Enzymic decomposition of cooked soybean by submerged koji. Ibid. 128-31.

Inhibition of the fungal propagation in the above digestion stage but retaining the microorganisms alive for use in the subsequent fermentation stage could best be accomplished by keeping the digestion at 43°. Under these conditions, the digestion soln., having total N and amino-N contents equiv. to that obtained by ordinary fermentation for 1 year, was obtained in 7-10 days. Blending this digestion soln. with various fermented ones and fermentation by usual method gave excellent crude soy sauce with favorable flavor and taste. The crude soy sauce thus obtained contained relatively small amts. of sugar, alc., and acid. The amino-N and glutamic acid contents in relation to the total N content were somewhat poor. Improvement of these qualities is discussed.
CA, V. 52, 1958: 16647c

MOGI, K.; OSHIMA, Y.; et al.

Soy sauce production using a submerged culture. VIII. Factors in the increase of free glutamic acid. (Noda Shoyu Co., Chiba, Japan) Hakko Kogaku Zasshi 1962, 40, 432-8; cf. Mogi, et al., ibid. 1961, 39, 665; CA 52, 16647c.

In a newly reported submerged process of soy sauce manuf., the increase in free glutamic acid was attributed to the autolysis of the koji mold which accumulated glutamic acid in its mycelia during growth.

CA, V. 62, 1965: 16884g

MOGI, M.; ONISHI, H.

The harmful yeasts which ferment sterilized soy. V. Microbiological properties of the isolated yeasts. (Noda Ind. Sci. Research Lab., Choshi City, Chiba-ken). J. Fermentation Technol. (Japan) 1955, 33, 396-403

All of the isolated yeasts fermented glucose and, on very long cultivation period, sucrose; galactose, maltose, and lactose were fermented by some strains. It was found in liquid culture cultivation that galactose could be assimilated by yeasts that did not ferment it.

CA, V. 50, 1956: 7890g

MOON, B.S.; LEE, Y.M.; et al.

Studies on fungicides of soybean sauce. Rep. Nation. Inst. Health R.O.K. 1969, 6, 251-7. Tab. 7 Ref. 19

Authors carried out a standardization test on soybean sauces collected from 74 manufacturers out of the 228 in Korea directly. The results are as follows:

1. In the pH value test, out of 74 samples, 6 (8.1%) are outside the government-permitted range, pH 4.5 to 5.8, while the mean value of all samples is 5.03
2. Specific gravities of 10 samples (13.6%) are lower than the government-permitted value, more than 1.142, while the mean value is 1.168.
3. Buffer forces of 20 samples (27.0%) exceed the government-permitted, less than 2.2, and the mean value is 1.82. In this test the unqualified value is much higher than any other test.
4. Salt contents of 14 samples (18.9%) are lower than the government-permitted value, more than 17.0% of the sauce, while the mean is 19.09%.
5. The contents of pure extracts of 15 samples (20.3%) are lower than the government-permitted value, more than 8.0% of the sauce, while the mean is 11.48%.
6. All the sauces are qualified in the test of arsenic of which the government-permitted value is less than 1.5ppm of the sauce.
7. The contents of heavy metals of 13 samples (17.6%) are more than the government-permitted value, less than 20ppm of the sauce.
8. The contents of total nitrogen of 9 (12.2%) are less than the

government-permitted value, more than 0.6%, while the mean is 0.88%.

9. It was revealed that unqualified samples of all are 35 (52.7%) in this survey.

Korean Sci Abstr., V. 2, 1970: 628

NAGASE, I.

Effect by an addition of the fermentative microorganism in the brewing of soy sauce. (Dep. Beverages Fermented, Agric. Univ. Tokyo, Tokyo, Japan). Hakko Kyokaishi 1972, 30(3), 116-22 (Japan).

Alcs. contents in mashes of soy sauce contg. yeasts and lactic acid bacteria were detd. by gas chromatog. PrOH and BuOH were generally present in a small amt. independent of the addn. of microorganisms. As much as 43-50 ppm of iso-BuOH was detected in the inoculated mashes, whereas naturally fermented mash without inoculation contained only 25 ppm. All mashes at 160 days of fermentation contained >46 ppm of isoamyl alc. The content of PhEtOH, a flavor component of soysauce, was 15 to 21 ppm after 160 days of fermentation.

CA, V. 77, 1972: 138482e

NAGASE, I.

Effect of addition of fermentative microorganisms in the brewing of soy sauce. 1. Changes in soy sauce flavor by addition of microorganisms, with special regard to enzymic activity and gas-chromatographic studies of alcohols and esters. 1. (Dep. Beverages Fermented, Agric. Univ. Tokyo, Tokyo, Japan). Hakko Kyokaishi 1972, 30(2), 64-75 (Japan).

The effects of various starters from different sources on soy sauce fermentation were reported. The addn. of Saccharomyces rouxii or Pediococcus soyae, and free amino acids at different fermentation stages for a period of 200 days made little difference on amino acids content, NaCl concn., color, and pH of the end products. Also reported were alc., free glutamic acid, and hydrolytic enzyme activities during the fermentation period.

CA, V. 77, 1972: 112651j

NAGASE, I.

Effect of the addition of the fermentative microorganism on the brewing of soy sauce. (Dep. Beverages Ferment., Agric. Univ. Tokyo, Tokyo, Japan). Hakko Kyokaishi 1972, 30(8), 339-50 (Japan).

Addn. of cultures of soy sauce yeasts and lactobacilli to soy sauce mash favorably affected the quality of the final product. Small amts. of lower alcs. and various esters at less than 5 ppm were detected by gas chromatog. at the beginning of the fermn. These increased with the course of fermn. Components with high concns. were: iso-BuOH 50.64, isoamyl alc. 58.23, EtAcO 51.11, and Et lactate 48.47 ppm. Contents of these compds. in mash with added organisms were generally higher than in ordinary mash.

CA, V. 79, 1973: 16909v

NAKADAI, T.; NASUNO, S.; et al.

Soy sauce using enzymic preparation(s).(Noda Institute for Scientific Research) Can. 971,031 (Cl. 99-142), 15 Jul 1975, Japan. Appl. 72 123,388, 11 Dec 1972; 64 pp.

Soy sauce was manufd. using the conventional starting materials but with com. enzyme prepns. or mixts. and without the use of koji. Thus, to a mixt. of puffed defatted soybean and crushed, toasted wheat was added aq. NaCl and the com. enzymes, Purozaimu, Biozyme C and Cellulosine AP, the mixt. contg. proteinase, aminopeptidase, amylase, and carboxymethylcellulase activity, and the mixt. was incubated at 29° for 20 days. Then a seed culture of Saccharomyces rouxii (ATTC 13356) was added and, after an addnl. 4-month incubation, an excellent soy sauce resulted, comparable in phys. and organoleptic properties and chem. compn. to the conventional ref. soy sauce.
CA, V. 83, 1975: 177006w

ODA, M.; IKEDA, K.; et al.

Aspergillus fungi which produce the most active tannase and the application of these fungi to the production of substitute soy sauce. (Osaka Univ.). J. Fermentation Technol. (Japan) 1949, 27, 16-23

Two strains, A. japonicus and A. oryzae, were isolated. The optimum temps. were 30-7° and 37°, resp., and optimum pH values were about 5.0 for both. When cultured on acorn, the former decompd. 40% and the latter decompd. 20% of the total tannin. Addn. of a small amt. of wheat bran promoted the growth and increased the tannase activity so that the tannin decompn. ratio was raised to 71% with A. japonicus and to 52% with A. oryzae. The culture mixt. of the former showed stronger amylase and protease activity than that of the latter. Employment of acorn as raw material with these fungi gave a soy-sauce product which was good in flavor and color for a substitute.
CA, V. 47, 1953: 7731c

OGURA, M.

Quantitative estimation of proteases in soy sauce koji. (Kagawa Prefect. Ferment. Food Exp. Stn., Uchinomi, Japan). Kagawa-Ken Hakko Shokuhin Shikenjo Hokoku 1969, (61), 18-24 (Japan).

A crude enzyme soln. was prepd. by homogenizing 150 g soy sauce koji for a min and shaking 5 g powd. koji in 95 ml McIlvaine buffer at 30° for an hr. After reaction of 1 ml enzyme soln. on 2 ml 2% casein at 30° for 10 min, 5 ml 0.4M Cl_3CCO_2H was added. After standing for 20 min at 30°, the protease activity was detd. by Folin's phenol method.
CA, V. 73, 1970: 30800f

OGURA, M.

Quantitative estimation of proteinase activity in soy sauce koji. (Kagawa Prefect. Ferment. Food Expt. Sta., Shodoshima, Japan). Chomi Kagaku 1969, 16(3), 1-6 (Japan).

Prepn. of 2% milk casein soln. as the substrate is as follows. Add 50 ml 0.2N lactic acid to 2 g casein, dissolve by heating at 60-70°, adjust to pH 3.0-4.5 by adding 0.1N NaOH, and fill to 100 ml with distd. H_2O. Or, add 25 ml 0.05N NaOH to 2 g casein, dissolve, adjust at pH 5.3-10.0 by adding 0.2N H_3PO_4, and fill to 100 ml. Prep. crude enzyme soln. as follows. Homogenize 150 g of well mixed koji at 20,000 rpm for 1 min, take 5 g pulverized koji into 300 ml Erlenmeyer flask, add 95 ml McIlvaine buffer soln., shake at 30° for 1 hr, and filter. Now add 1 ml 5% crude enzyme soln. to 2 ml 2% casein. Incubate at 30° for 10 min. Add 5 ml 0.4M Cl_3CCO_2H. Shake and keep at 30° for 20 min. Filter. Est. the proteinase activity by comparing with the color (660 mμ) of the mixt. of a known amt. of tyrosine in 0.4M Na_2CO_3 and the Folin phenol reagent.
CA, V. 74, 1971: 43955q

OGURA, M.; ONISHI, T.
Real soy sauce manufacturing. (Kagawa Ken Ferment. Food Exp. Stn., Takamatsu, Japan). Chomi Kagaku 1971, 18 (6), 219-23 (Japan).

Possible ways to prevent the mold growth in soy sauce were investigated. A 2nd pasteurization at 50° for 20 min of soy sauce previously filtered and pasteurized gave satisfactory results and addn. of 2.5% EtOH prevented mold growth.
CA, V. 80, 1974: 106944c

OKA, S.; NAGATA, K.
Peptides in soy sauce. I. Isolation and characterization of neutral peptides in soy sauce. (Fac. Eng., Hiroshima Univ., Japan). Agr. Biol. Chem. 1974, 38 (6), 1185-94 (Eng).

Three glycodipeptides and 8 dipeptides were isolated from soy sauce and characterized as its major neutral peptide components.

CA, V. 83, 1975: 162335d

OKA, S.; NAGATA, K.
Peptides in soy sauce. II. Isolation and characterization of acidic peptides in soy sauce. (Fac. Eng., Hiroshima Univ., Hiroshima, Japan). Agr. Biol. Chem. 1974, 38 (6), 1195-1202 (Eng).

Four dipeptides and sugar derivs. of 10 dipeptides were isolated from soy sauce and characterized as its major acidic components.
CA, V. 81, 1974: 150674j

SAKAGUCHI, K.
The activities of bacteria in soybean sauce brewing. II. The proteinases and the occurrence of bacterial spores in the soy mash. (Noda Institute Sci. Research). Bull. Agr. Chem. Soc. Japan 1958, 22, 345-52.

The characteristic of proteinase activity of soy mash was compared with that of a pure culture of Aspergillus sojae. Casein was used as the substrate, and the activity was measured by Anson's method (C.A. 32, 9201⁷). The proteinase activity of the mash showed the same characteristics with that of A. sojae on pH-activity curves, against several inhibitors, and on acid or alk. treatments. Occurrence of vegetative cells of bacteria was examd. to find out that only a few were present in the mash. They might have survived as spores in the soy mash.

III. Taxonomic studies on Pediococcus sojae nov. sp., the soy sauce lactic acid bacterium. Ibid. 353-62.

Thirteen strains of salt-tolerant lactic acid bacteria were isolated from soy-sauce brewing mash, and their taxonomical characteristics were examd. Eleven strains produced D-lactic acid and 2 strains producedDL-and a small amt. of D-lactic acid. Two nutritional factors were required for the growth of those strains. The one might be a polypeptide, because it was provided by the addn. of polypeptone (Takeda Co.), hydrolyzed milk casein by the alk. proteinase of A. sojae or the water ext. of A. sojae mold bran. The other factor was a dialyzable substance contained in heart infusion broth, beef ext., yeast ext., and soy mash. Microbiol. characteristics of the bacteria were also described.
CA, V. 53, 1959: 15468c

SAKAGUCHI, K.
Studies on the activities of bacteria in soy sauce brewing. IV. Proteases, transaminases of Pediococcus soyae, new species, and its numerical transition in soybean mash. (Noda Inst. Sci. Research, Chiba). Bull. Agr. Chem. Soc. Japan 1959, 23, 22-28; cf. C.A. 53, 15468c.

Activities of protease and transaminase of Pediococcus soyae which was the most active bacterium in proteolitic activity during soy sauce brewing are described, together with the data of numerical transition of Pediococcus soyae and lactic acid bacteria during the brewing. No proteolytic activity was found in the cultural filtrate of Pediococcus soyae. The cell-free ext. of it showed proteolytic activity that was weaker than that of Lactobacillus casei in cheddar cheese. Transaminase activities of Pediococcus soyae were demonstrated by using both the resting cell suspension and the crude-cell ext. Glutamic acid was formed from α-ketoglutaric acid. Alanine, leucine, aspartic acid, or NH_4Cl were used as the NH_2 donors. P. soyae could ferment starch.
CA, V. 53, 1959: 16464b

SAKAGUCHI, K.
The activities of bacteria in soy-sauce brewing. V. The effects of Aspergillus sojae, Pediococcus soyae, Bacillus subtilis, and Saccharomyces rouxii in purely cultured soy-sauce brewing. (Noda Inst. Sci. Research, Noda-shi, Chiba). Bull. Agr. Chem. Soc. Japan 1959, 23, 100-6; cf. C.A. 53, 17464b.

A. sojae was purely cultured on the materials of soy koji and was soaked in sterile 26% NaCl soln., to which were added P. soyae and S. rouxii to exam. their roles in soy-sauce brewing. B. subtilis was added in the form of wheat-bran culture into the purely cultured soy mash. An appropriate addn. of B. subtilis favored the development of aroma and elimination of the polypeptide-like turbidity of soy sauce. P. soyae stimulated the formation of org. acids. The low pH was favorable for the sound fermentation, but

too rapid drop of pH was undesirable. S. rouxii produced EtOH and flavor. A. sojae had all the activities necessary for the fundamental reactions for soy-sauce brewing, but the soy sauce brewed by it alone was not equal to the one which was made with mixed organisms.
CA, V. 53, 1959: 22727a

SAKAGUCHI, K.
Studies on the activities of bacteria in soy sauce brewing. VI. Growth of Pediococcus soyae nov. sp. in highly concentrated solutions of inorganic salts and sugars. (Noda Inst. Sci. Research). Bull. Agr. Chem. Soc. Japan 1959, 23, 438-42; cf. C.A. 53, 22727a.

The growth of P. soyae in concd. soln. of salts and sugars was studied. The viable count of P. soyae dropped sharply, when transferred to the medium contg. 18% NaCl from the medium contg. 5% NaCl. After 2-3 days it started to grow in the concd. salt soln. in the same way as in the medium of low NaCl concn. Na^+, K^+, Cl^+, and SO_4^{--} were not toxic, even at the concn. of 133 atm. osmotic pressure. But Li^+, Ca^+, Mg^{++}, and Br^- were toxic. Growth occurred even in 50 and 60% of glucose and sucrose soln., resp.

VII. P-factor, a new peptidic growth factor for Pediococcus soyae. Ibid. 443-450.

A new growth factor for P. soyae was found and was named P-factor. The P-factor was present in the partially hydrolyzed Hammersten's milk casein, and could be a peptide. The P-factor was different from the S-factor, and the latter was only active in the presence of the former.
CA, V. 54, 1960: 2652i

SAKAGUCHI, K.
Activity of bacteria in soybean sauce fermentation. VIII. Betaine as a growth factor for Pediococcus soyae. (Noda inst. Sci. Research, Noda-shi, Chiba). Bull. Agr. Chem. Soc. Japan 1960, 24, 489-96; cf. CA 54, 2652h.

Pediococcus soyae required glycine-betaine, 30 mg./1., as a growth factor as well as 1.0% polypeptone when cultured on a synthetic medium contg. 18% NaCl.
CA, V. 55, 1961: 1788c

SAKAGUCHI, K.
Activities of bacteria in soy sauce brewing. X. Carnitine as a growth factor for Pediococcus soyae. (Noda Inst. Sci. Research, Chiba). Agr. Biol. Chem. (Tokyo) 1962, 26, 72-4; cf. CA 55, 10577b.

DL-Carnitine-HCl, 10 mg./1., was as effective as glycine betaine-HCl, 30 mg./1., for the growth of P. soyae.
CA, V. 56, 1962: 13354fghi

SASAKI, S.; HAGA, H.; et al.
Soy brewing. (Sendai Miso-Soy Co., Ltd.) Japan. 70 32,236 (Cl.C 12x), 17 Oct 1970. Appl. 20 Apr 1967; 4 pp.

Mealy defatted soybeans are screened to remove a powdery fraction of particle size <8 mesh. The remainder is applicable for soy brewing instead of usual flakes. The screening prevents bacterial contamination during koji manuf. on the solid medium.
CA, V. 74, 1971:52301w

SLAMET, D.S. and GANJAR, I.
Pengaruh Rhizopus oryzae dan Aspergillus oryzae terhadap kwalitas kecap. (A Study on the influence of Rhizopus oryzae and Aspergillus oryzae on the quality of "kecap" (Indonesian soysauce). Penelitian gizi dan makanan 1972, 2, 88-95.

A study on the fermentation process of kecap has been carried out with different soaking time and different micro-organisms (Aspergillus oryzae, Rhysopus oryzae, and mixture of both). Four liters of kecap was obtained from one kilogram of raw black soybeans. Nitrogen analysis were made throughout the process. The study indicates significant influence of soaking time upon nitrogen content of kecap. Aspergillus oryzae was more active than Rhyzopus oryzae in producing proteolytic enzymes. Both strains produced no aflatoxin of B_1 and B_2 types in the substrate. The organoleptic test revealed no significant differences in aroma and flavor resulting from the use of different microorganisms and soaking times. Author.

SONG, S.H.; KIM, J.H.; et al.
Preservation of soy sauce. I. Isolation of pellicle forming yeasts from soy sauce. (Army Res. Lab., Seoul, Korea). Kisul Yon'guso Pogo 1963, 2, 32-7 (Korean).

Soybean sauce is deteriorated by yeasts which form a pellicle on the sauce during long-term storage. Hansenula anomala group, Zygosaccharomyces japonicus group, and a group of Zygosaccharomyces were isolated from sauce contaminated by yeast. The optimums for these yeasts growing are 28-32°, pH 4.5-5.5, and 3-6 wt. % NaCl, in the sauce, and they do not grow at 52-5° and >26% NaCl.
CA, V. 65, 1966: 7896e

SONG, S.H.
Preservation of soy sauce. II. Pellicle forming yeasts as influenced by preservatives. (Army Res. Lab., Seoul, Korea). Kisul Yon'guso Pogo 1963, 2, 38-42 (Korean); cf. proceeding abstr.

The effects of fungicides [vitamin K_3 or K_5, p-hydroxybutyl benzoate (POBB), p-hydroxypropyl benzoate (POBB), sorbic acid, capric acid, and polyoxyethylene lauryl alc. ether (emulgen-106)] on the yeasts (Hansenula anomala group, Zygosaccharomyces japonicus group, and a group of Zygosaccharomyces) forming a pellicle on soy sauce are studied. Min. concns. of these effective preservatives in the sauce are 0.005% vitamin K_3 or K_5, 0.007% POBB, 0.007% POBB, 0.05% sorbic acid, 0.1% emulgen-106, and 0.003% capric acid. The use of each sorbic acid-emulgen-106, sorbic acid-POBB, sorbic acid-vitamin K_3, and POBB-vitamin K_3 mixts. are also effective.
CA, V. 65, 1966: 7896f

SUGIMORI, T.; JOSE, H.
Halotolerant lactic acid bacteria relating to soy sauce brewing. I. Isolation and taxonomic studies of Tetracoccus. (Kyoto Res. Lab., Marukin Shoyu Co., Ltd., Kyoto, Japan). Hakko Kogaku Zasshi 1970, 48(4), 218-28 (Japan).

Halotolerant lactic acid bacteria were isolated from both soy koji and soy mash and studied taxonomically. Among these isolated bacteria, a tetrad from bacterium related closely to T. soyae was considered to be the most important in the soy sauce brewing. The properties of this bacterium, which was tentatively named Tetracoccus No. 100, are as follows: Tetracoccus No. 100 is a halotolerant facultative anaerobe, appearing mostly in either tetrad or diploid form, is gram-pos., nonmotile, non-spore-forming, catalase-pos., reduces nitrate, ferments salicin and glycerol, but not galactose, and mainly produces DL- and L-lactic acid from fermentable sugars. Only biotin and nicotinic acid are essentially required for the growth of this bacterium. The guanine-cytosine (GC) content of DNA in Tetracoccus No. 100 is not significantly different from those in Pediococcus soyae and T. soyae.
CA, V. 73, 1970: 54581r

TAKEDA, R.; NAKAYAMA, S.
Determination of peptidase activity in Aspergillus. II. Application of potent peptidase strains for the brewing of a new type of soy sauce. (Kazawa Fermented Foods Expt. Sta., Uchinomi, Japan). Kagawa-Ken Hakko Shokuhin Shikenjo Hokoku 1964, (57), 16-24 (Japan); cf. CA 60, 16467a

When the conditions for peptidase detn., such as the substrate for the test strain, the method of the prepn. of enzyme soln., and procedure for peptidase measurement were followed strictly, the results of peptidase activity obtained were fairly reproducible. Higher peptidase activities were generally found in 9 strains of A. oryzae than in 13 strains of A. soyae. The pH of a 10% crude enzyme soln. from A. oryzae was greater than that from A. sojae and it increased with increasing protein in the substrate. As the carbohydrate/protein ratio of the substrate increased from 1 to 3, the optimum pH of the peptidase of 2 strains decreased from 7 to 6. When a strain of A. oryzae having potent peptidase and a strain of A. sojae having weak peptidase were used for the brewing of a new type soy sauce, amino acid formation was completed after a month with the former and after 2 months with the latter
CA, V. 64, 1966: 18318g

TAKEDA, R.; NAKAYAMA, S.
Peptidase of Aspergilli. III. Enrichment of koji with peptidase and a proposal of rapid fermentation of shoyu. (Prefect. Ferment. Foods Expt. Sta., Shodoshima, Japan). Chomi Kagaku 1968, 15 (3), 19-25 (Japan).

Koji was prepd. from wheat, defatted soybean flake partly digested with bacterial endopeptidase, and Aspergillus soyae No. 108 rich in exopeptidase. The use of this koji permitted a shortening of duration of fermentation from 1 year to about 2 months.
CA, V. 72, 1970: 33989q

TAKEDA, R.; NAKAYAMA, S.

Utilization of new anti-mold preparation for soy sauce. (Kagawa Fermented Foods Expt. Sta., Uchinomi, Japan). Kagawa-ken Hakko Shokuhin Shikenjo Hokoku 1964, (56), 18-24 (Japan).

An anti-mold prepn. contg. 15% p-hydroxybenzoic acid Bu ester, 15% p-hydroxybenzoic acid iso-Bu ester, 20% p-hydroxybenzoic acid iso-Pr ester, and 50% water was added to raw natural soy sauce (1: 50,000), the benzoates were hydrolyzed to p-hydroxybenzoic acid by esterases in the soy sauce, and mold appeared when kept at 30° for 2 days. It was necessary to inactivate the esterases in natural soy sauce by heating at 72-80° to prevent the appearance of mold.
CA, V. 65, 1966: 7893e

TAKEDA, R.; TANIGAWA, Y.; et al.

Soy sauce manufacturing. I. Continuously defatted soy beans and influence of koji protease activity on rate of nitrogen utilization in the mash. (Kagawa Prefect. Ferment. Food Exp. Stn., Uchinomi, Japan). Kagawa-Ken Hakko Shokuhin Shikenjo Hokoku 1972, (64), 8-17 (Japan).

Large and medium defatted soybean flakes prepd. by batch and continuous processes, resp., and meal by continuous process were made into koji with almost the same amt. of wheat, and were fermented in 22.2-22.6% NaCl soln. The neutral protease activity of koji and the N utilization ratio in soy sauce were best with the medium flakes (57.5, 80.5%), followed by the meal (56.4, 79.9%) and large flakes (50.2, 78.4%), resp. Pilot plant tests in 18 factories with large or medium flakes with wheat as the raw material showed that the neutral protease activity and N utilization ratio ranged from 54 to 25.5 and from 85.29 to 74.42%, resp. The correlation coeff. between these 2 values was $\gamma = 0.497$. Mean neutral protease activities and N utilization ratios with medium and large soybean flakes were 42.9, 81.5% and 39.0, 80.3%, resp. Sensory tests of all raw soy sauce did not show any relation between the flavor of soy sauce and protease activity.
CA, V. 79, 1973: 103798b

TAKEDA, R.; TANIGAWA, Y.; et al.

Soy sauce manufacture with enzyme agents. II. Manufacturing experiments on soy sauce with protease agents in pilot plant. (Kagawa Prefect. Ferment. Food Exp. Stn., Uchinomi, Japan). Kagawa-Ken Hakko Shokuhin Shikenjo Hokoku 1972, (63), 21-8 (Japan).

Koji made from 120 g digested mash, 60 g seed koji, and 60 g crushed wheat at 27° was added to 820 g digested mash with 170 g NaCl, and was incubated at 28-30° for 3 months. The solubilization ratio was 82.5% and the soy sauce obtained had almost the same quality as that brewed for 1 year. By scaling up this method to 300 kg defatted soybeans, soy sauce of good quality was obtained. The amino acid compn. of this soy sauce was similar to that brewed under normal conditions, except for a lower glutamic acid content.
CA, V. 79, 1973: 77164v

TAKEDA, R.; YAMAMOTO, Y.; et al.

Utilization of new anti-mold preparation for soy sauce. Supplement. (Kagawa Fermented Foods Expt. Sta., Uchinomi, Japan). Kagawa-ken Hakko Shokuhin Shikenjo Hokoku 1965, (57), 7-15 (Japan)

The loss of anti-mold agents in soy sauce increased with the increase of flocculents in raw soy sauce. Since anti-mold agents were adsorbed by flocculents in soy sauce and removed with the flocculates by sedimentation, centrifugation, or filtration, the clarification of soy sauce before adding anti-mold agents was necessary.
CA, V. 65, 1966: 7893f

TAKEDA, R.; YAMAMOTO, Y.; et al.

Soy sauce brewing with Aspergillus ochraceus isolated from dried bonito. (Kagawa Fermented Foods Expt. Sta., Uchinomi, Japan). Kagawa-ken Hakko Sholuhin Shikenjo Hokoku 56, 10-17 (1964) (Japan).

When A. ochraceus species and A. sojae were incubated on a solid medium of wheat bran, defatted soybean meal, and wheat flour for 72 hrs. at 30°, protease activity at pH 7-8 of both koji exts. reached a max. and that of the former was about 1.4 times that of the latter if the ratio of carbohydrate to crude protein in the substrate was kept about 2. The protease activity decreased at pH 3.5 in both cases, and that of the former was slightly lower. The protease activity of A. ochraceus at pH 3.5 was esp. low when the ratio of carbohydrates to crude protein was about 1. In lab. tests with 100-ml. flasks, N solubilization ratio and reducing sugar content after soy sauce brewing with A. ochraceus were 88% and 1.94%, while those with A. sojae were 83% and 1.11%. According to a pilot plant test, soy sauce brewed with A. ochraceus contained more reducing sugars and had darker color with higher N solubilization ratio than that with A. sojae. One of the defects of A. ochraceus was throat irritation by the scattered conidia.
CA, V. 65, 1966: 4548e

TSUKAMOTO, H.

Fungicides for soy sauce. I. Fungicidal action of ethyl thiocyanoacetate. (Univ. Tokyo). J. Pharm. Soc. Japan 1951, 71, 400-2.

$CH_2(CNS)CO_2Et$ (I) at the diln. of 1:50,000 prevented the growth of molds for 30 days. All other fungicides tested were less effective than I. They were in order of I > α-$C_{10}H_7OH$ > allyl mustard oil > β-$C_{10}H_7OH$ > p-$HOC_6H_4CO_2Bu$ > $PhCO_2H$ > salicylic acid.

II. Fungicidal action of esters of thiocyanoacetic, acetic, and chloroacetic acids for soy sauce. Ibid. 403-7.

Me, Et, iso-Pr, iso-Bu, and iso-Am esters of CH_2ClCO_2H were more effective than those of AcOH; the esters of $CH_2(SCN)CO_2H$ were the strongest. The efficiencies of alkyl groups were in order of $Me_2(CH(CH_2)_2$ > Me_2CHCH_2 > Me_2CH > Et > Me.

III. Fungicidal action of ethyl esters of thiocyano fatty acids, fatty acids, and bromo fatty acids for soy sauce. Ibid. 408-13.

Antiseptic action of Et esters (II) of propionic, butyric,

caproic, capric, and lauric acids and their α-bromo (III) and α-thiocyano derivs. (IV) were in the order of IV > III > II.
CA, V. 45, 1951: 7719h

TSUKAMOTO, H.
Fungicides for soy sauce. IV. Relation between fungicidal action for soy sauce of diethyl esters of dibasic fatty acids, their halogen and thiocyano substitutes. (Univ. Tokyo). J. Pharm. Soc. Japan 1951, 71, 471-3; cf. C.A. 45, 7719h.

Antiseptic action of $CHSCN(CO_2Et)_2$ and $EtO_2CCH_2CHSCNCO_2Et$ were > $CHCl(CO_2Et)_2$ and $EtO_2CCHBrCH_2CO_2Et$ which were > $CH_2(CO_2Et)_2$ and EtO CCH CH CO Et.

V. Relationship between fungicidal action for soy sauce of esters of fatty acids, halogenated fatty acids and thiocyano fatty acids. Ibid. 473-4.

A summary of the preceding expts. (loc. cit.).
CA, V. 45, 1951: 8673f

WANG, H.L.; VESPA, J.B.; et al.
Acid protease production by fungi used in soybean food fermentation. (North Reg. Res. Lab., Agric. Res. Serv., Peoria, Ill.) Appl. Microbiol. 1974, 27(5), 906-11 (Eng).

Growth conditions for max. protease prodn. by Rhizopus oligosporus, Mucor dispersus, and Actinomucor elegans, used in oriental food fermns., were investigated. Enzyme yields by all 3 fungi were higher in solid substrate fermns. than in submerged culture. The level of moisture in solid substrate must be at ~50-60%. Very little growth of these fungi was noted when substrate moisture was <35%, whereas many fungi including most storage fungi generally grow well on solid substrate with that level of moisture. Among the 3 substrates (wheat bran, wheat, and soybeans) wheat bran was the most satisfactory for enzyme prodn. The optimal conditions for max. enzyme prodn. of the 3 fungi grown on wheat bran were R.oligosporus, 50% moisture at 25° for 3-4 days; M. dispersus, 50-63% moisture at 25° for 3-4 days; A. elegans, 50-63% moisture at 20° for 3 days. Because these fungi are fast growing and require high moisture for growth and for enzyme synthesis, the danger of contamination by toxin-producing fungi would be minimal.
CA, V. 81, 1974: 48515w

WATANABE, Y.; KUMAKI, F.; et al.
Relation of enzyme activities with temperature of shoyu koji making. II. Influence of the fermentation of mash and ripening process. (Ajinomoto Co., Kawasaki, Japan). Chomi Kagaku 1967, 14(2), 33-49 (Japan).

Shoyu koji was made at 5 different temps. The koji highest enzyme activities did not necessarily give highest utilization and solubilization of N compds. in the mash. Among others, pH was important. Good results could be obtained when proteinase activity of koji was high (made below 30°) and the initial fall of pH was

gradual in the mash. In such a case, glutamic and other amino acids increased rapidly and org. acids appeared slowly. Detns. were made of pH, NaCl, total N, ammonia N, glutamic acid and 16 other amino acids, reducing sugars, EtOH, AcOH, lactic, and succinic acids during the ripening of shoyu.
CA, V. 71, 1969: 69441c

WENNO, B.J.
Mikroba dan kondisinya dalam pembuatan soy sauce (Microorganism and its condition in the making of soy sauce). Thesis Dept. Biologi ITB Bandung 1972, 95 p.

Soysauce is a roughage for the first with nutritive value and one of the important product from soybean. The process was prepared by extracting the nutrition compound from fermented soybean. Aspergillus oryzae (Ahlburg) Cohn was popular on soysauce production. The optimal condition for its growth on soybean cooked founded at 30°C and 50% relative-humidity. After fermented with A. oryzae the amino acids compounds was leucine, isoleucine, phenylalanine, valine, methionine, proline, alanine, glycine, threonine, glutamic acid, aspartic acid, arginine, histidine, lesine, ornithin, and serine. The similar amino acids also founded from soysauce fermented with the combine Aspergillus flavus Link & A. oryzae and A. flavus-oryzae & Hansenula anomala (Hans) Syd. High total nitrogen from soysauce coming after fermented from A. oryzae compared by A. flavus-oryzae and the highest was the product from A. flavus-oryzae-Hansenula. Organoleptis test from the variation soysauce presented the highest significance on color if fermented by A. flavus-oryzae.
Author

YAMADA, K.; INOUE, H.
Variation of enzyme activities during the accumulation process of soy-sauce making. J. Soc. Brewing (Japan) 1953, 48, 189-93

The protease and amylase activities during the accumulation process (a new rapid method) and during the ordinary process were detd. The activities of both enzymes decreased more markedly by the accumulation process than by the ordinary process. In the latter process protease activity was maintained for 1 year without change.
CA, V. 49, 1955: 5764b

YAMAMOTO, Y. and TAKEDA, R.
Antimicrobial activity of sodium benzoate in soy sauce. II. Kagawa-ken Hakko Shokuhin Shikenjo Hokoku 1963, 56, 25-30 (Japan); cf. preceding abstr.

When raw soy sauce at pH 4.82 contg. 18.0% NaCl and 1.01% total N was stored at 30° for 40 days in the usual wooden barrel, the growth of microbes was inhibited by the addn. of 3×10^{-4} (as BzOH) NaOBz. Soy sauce contg. NaCl 17.3, total N 0.76, and sugar 2.1% with 3×10^{-4} NaOBz added could be stored at 30° for 40 days without microbial growth in the wooden barrel if the pH was $<$ 4.9. When soy sauce contg. NaCl 16.2, total N 0.82, and

sugar 0.75% at pH 4.87 was stored in July in the barrel, the addn. of 5 X 10^{-4} NaOBz inhibited microbial growth at least for 17 days.
CA, V. 65, 1966: 4531a

YAMAMOTO, Y.; YANAGIDA, F.; et al.
Changes of enzyme activities during preparation of the koji for raw soy sauce. (Tokyo Univ. Agric., Tokyo, Japan). Nippon Shokuhin Kogyo Gakkai-Shi 1972, 19(1), 29-30 (Japan).

Koji was prepd. from wheat and parched soybeans steeped in water and the mixt. was inoculated with Aspergillus oryzae at 27-9° for 70 hr. Activity of all enzymes increased rapidly from 20 to 40 hr after inoculation. Phosphatase activity reached max. after 40 hr, and then increased only slightly up to 70 hr.; α- and β-amylases and acidic and alk. protease reached max. activity after 48 hr, and neutral protease reached max. after 60 hr. These activities tended to remain const. or decrease slightly. Evidently 48 hr is the most desirable cultivation time.
CA, V. 81, 1974: 150264a

YAMASAKI, K.; FUJISHIMA, T.; et al.
Phosphatase in soy sauce. VI. Preparation of enzyme solutions. (Yamasa Shoyu Co., Choshi, Japan). Chomi Kagaku 1969, 16(3), 7-13 (Japan).

Previously, enzyme solns. were prepd. by dialyzing soy sauce with a cellophane membrane to remove NaCl, inorg. P, and some pigments, however, the dialysis took 18 hr. Now, gel filtration with Sephadex is suitable for prepg. the enzyme soln. Among Sephadex G-25, 50, 75, 100, and 200, G-50 was most suitable. The column of 3.1 X 40 cm (vol. 300 ml) was used for 5 ml soy sauce. Discard initial 80 ml and collect 50 ml of the subsequent fractions. Conc. to 10 ml with a collodion pack. This new method takes only 3 hr.
CA, V. 73, 1970: 43957s

YOKOTSUKA, T.; ASAO, Y.; et al.
Short-period brewing of soy sauce. (Kikkoman Shoyu Co., Ltd.). Japan. 21,737('67) (Cl. 36 D 25), Oct. 26, Appl. July 18, 1964; 2 pp.

A selected Torulopsis strain, e.g. T. versalitis, is used with Saccharomyces rouxii for soy sauce brewing at 30-5° for 3 months to give a product of enhanced flavor with a 4,2-Et(MeO)C_6H_3OH content of 0.1-10 ppm.
CA, V. 68, 1968: 28642p

YOKOTSUKA, T.; ASAO, Y.; et al.
Short-period brewing of soy sauce. (Kikkoman Shoyu Co., Ltd.). Japan. 21,738('67) (Cl. 36 D 25), Oct. 26, Appl. July 18, 1964; 2 pp.

A selected Torulopsis strain, e.g. of T. versalitis is used with Saccharomyces rouxii for accelerated brewing of soy sauce and the product is blended with ordinary soy sauce to a final 4,2-Et(MeO)C_6H_3OH content of 0.1-10 ppm.
CA, V. 68, 1968: 28643q

YONG, F.M.; WOOD, B.J.B.
Microbiology and biochemistry of soy sauce fermentation. (Dep. Appl. Microbiol., Univ. Strathclyde, Glasgow, Scot.). Adv. Appl. Microbiol 1974, 17, 157-94 (Eng).

A review, with 259 refs.
CA, V. 82, 1975: 96431h

YONG, F.M.; WOOD, B.J.B.
Sucrase from soy sauce molds. (Dep. Appl. Microbiol., Univ. Strathclyde, Glasgow, Scot.). Trans. Br. Mycol. Soc. 1975, 64, Pt. 1, 143-6 (Eng).

Invertase is produced as part of an enzyme complex released by growing vegetative hyphae of Aspergillus oryzae during the prodn. of soy sauce. Sucrase-hydrolyzing activity is detectable at a very early stage of mold growth, and persists through the koji stage.
CA, V. 82, 1975: 167216e

YOSHII, H.; KATO, H.
Microbiology of vegetables soaked in soy sauce. I. Microflora and taxonomy of principal strains. (Aichi Food Ind. Expt. Sta., Nagoya, Japan). Nippon Shokuhin Kogyo Gakkaishi 1966, 13(4), 133-7 (Japan).

The soy sauce used for soaking contained total N 0.67, amino-N 0.43, NaCl 10.1, total sugar 2.05, and reducing sugar 1.88%. The Lactobacillus plantarum isolated from the soaked vegetables was considerably resistant to NaCl and seemed to be the major cause of spoilage.
CA, V. 65, 1966: 15978g

c. Fermentation Studies

AMANO, T.; KANOMATA, K.; et al.
Preservatives for shoyu (fermented soy sauce). VII. Determination of preservatives by gas chromatography. (Food Res. Inst., Nagoya, Japan). Nippon Shokuhin Kogyo Gakkaishi 1967, 14(11), 499-503 (Japan).

Sorbic, benzoic, salicylic, and dehydroacetic acids, Me, Et, Pr, iso-Pr, Bu, iso-Bu, and sec-Bu esters of p-hydroxybenzoates, and vitamin K_3 were examd. Silicon DC-550, Apiezon grease M, polyethylene glycol 6000, poly(diethylene glycol adipate), poly(1,4-butandiol succinate), and Tween 20 were applicable for gas chromatog. of preservatives. H_3PO_4 was used to prevent tailing of acidic compds. The acidic compds. volatilized below 170° and the neutral compds. did below 300°. The best results were obtained by the use of 3% poly(1,4-butandiol succinate) and 1% H_3PO_4 on Diasolid S as a column. Iso-Bu, Bu, and iso-Pr esters of p-hydroxybenzoate in shoyu were detd. within $\pm$ 6%.
CA, V. 69, 1968: 75636v

CARENBERG, C.O.

Traditional fermentation processes used in the production of protein-rich foods. (Karolinska Inst., Stockholm, Swed.). Sv. Kem. Tidskr. 1968, 80(8), 252-8 (Swedish).

A review describing various microbial fermentation processes used primarily in some Asian countries. The starting material is usually soybeans, rice, or wheat or a combination of them. 23 references.
CA, V. 70, 1969: 10346b

CHO, M.J.; KIM, Z.U.

Studies on the quick ripening process for soysauce. J. Kor. Agr. Chem. Soc. 1971, 14(1), 19-27. Fig. 9 Tab. 5 Ref. 36

This experiment was conducted as a preliminary test to invent the quick ripening process for soysauces. The bran koji extract of 2 kinds of mold (Asp. niger and Asp. sojae) was used as enzyme sources in order to improve the rate of enzymatic conversion of raw materials and shorten the ripening period of soysauces. Soybean koji (included Asp. sojae) and steamed soybean were enzymatically decomposed for 8 hours at 40°C, pH 4-6 with stirring at a rate of 1500 rpm. After the enzymatic treatment, soysauces were fermented by 4 kinds of processes with the above-mentioned salt tolerant microorganisms inoculated. After 4 weeks, sensory evaluation for these soysauces products and analysis of chemical components were carried out.

The results obtained were summarized as follows.

1. Soysauces prepared from decomposed koji by Asp. niger enzyme complex showed higher extractables, such as total nitrogen, amino nitrogen, pure extract and reducing sugar, than any other procedure. Extracted amounts of each components of soysauces prepared from this process during 1 month were similar to those of soysauces made from general procedure (control) for 5 to 6 months.
2. According to sensory evaluation, soysauce prepared from decomposed koji also showed best taste and were similar to that of soysauces prepared by general method for 6 months.

Korean Sci. Abstr., V. 3, 1971: 529

FUJISAWA, S.

Rapid fermentation of soy sauce. Japan. 7199 ('54), Oct. 30.

A culture of Bacillus natto, B. subtilis, or B. mesentericus on cooked soybeans is heated with water for 20 hrs. at 60°, sterilized by boiling, and filtered to sep. it into filtrate (I) and residue (II). I is deodorized by passing in air at 100°, and II is mixed with roasted wheat and a culture of Aspergillus is made as usual and fermented by mixing the I and salt. Japan. 7200('54). Cooked soybeans contg. a culture of B. natto, B. subtilis, or B. mesentericus is divided in 2 portions. The one is fermented with yeast for swelling and roasted to obtain a porous product which is inoculated with Aspergillus. The other portion with water is fermented with yeast for 10-20 hrs. and 48 hrs. at 60°, sterilized by boiling while air is passed in, and then fermented by mixing with the above solid culture.
CA, V. 50, 1956: 3709b

FUJISAWA, S.

Food product for brewing of soy sauce of fermented soybean paste. Japan. 442('55), June 28.

A protein-rich food product is prepd. from sweet or white potatoes by addn. of org. and inorg. N sources followed by cultivation with microorganisms. The potatoes are crushed, extd. with water, the ext. hydrolyzed with malt flour, and $(NH_4)_2SO_4$ added to the hydrolyzate. The to insol. residue is added org. or inorg. N sources. The mixt. is steamed, cultured with slime bacteria, such as Bacillus natto, B. subtilis, and B. mesentericus, mixed with the hydrolyzed ext., fermented by yeast, and the culture mixed and kneaded with wheat flour or starch to give a granular product. The product contains large amts. of vitamins and proteinaceous components and can be used as a food or as a material for the production of soy sauce (at 60%) or fermented soybean paste (at 30%). Japan. 4443 ('55). Soybeans or defatted soybeans are hydrolyzed with acid or alkali, neutralized, mixed with fish meal or pressed cake of chrysalis and inorg. N sauces, cultured with slime bacteria, and fermented with yeast.

CA, V. 51, 1957: 13311b

HAMANO, M.; AOYAMA, Y.

Effect of saturated fatty acids on hygroscopic equilibriums of spray dried soy sauce. (Kikkoman Shoyu Co., Ltd., Noda, Japan). Nippon Nogei Kagaku Kaishi 1973, 47 (11), 719-25 (Japan).

The hygroscopicity of spraydried soy sauce was studied. Soy sauce produced from whole soybeans adsorbed less moisture than that from defatted soybeans, and the hygroscopicity was decreased with the redn. of the fermn. period and developed color. The hygroscopicity decreased and the heat of sorption increased with an increase of C no. of the fatty acid (C_{12}-C_{18}) added to soy sauce before drying. Soy sauce contg. stearic acid gave a broader NMR proton peak than that without stearic acid, and the result suggested a decrease in the degree of freedom of H_2O adsorbed in stearic acid-free soy sauce.

CA, V. 80, 1974: 144493n

HINO, T.; IWASHITA, S.

Semichemical fermentation of soybean sauce. (to Ajinomoto Co.). Japan. 3249('54), June 5.

An aq. soln. (5 cu.m.) contg. 1.2% amino-acid N, 400 kg. NaCl, and 250 kg. glucose in a fermentation vessel is suspended with a basket contg. 750 kg. of Aspergillus. The soln. is fermented for 1 month with occasional shaking of the basket.

CA, V. 49, 1955: P 7186a

IRIE, T.

Brewing of soy sauce by submerged mold enzymes. I. Formation of protease by molds under shaking culture. 1. (Kyushu Univ., Fukuoka). J. Agr. Chem. Soc. Japan 1954, 28, 550-6

Some strains of Aspergillus and Mucor produced favorably protease on a medium contg. 3% soybean flour (defatted) and 0.3% glucose

under shaking culture at 25-30° in about 30 days. Three strains were selected from 22 industrially useful strains for their producibility of protease and their suitability for soy-sauce brewing.
CA, V. 50, 1956: 15020b

IRIE, T.; HANADA, S.
Brewing of soy sauce. (to Japan Seasoning Brewing Co.). Japan. 7586('56), Aug. 31.

Cooked raw materials are fermented by liquid koji of Aspergillus oryzae, in a closed container without the addn. of NaCl, and the fermented mash is poured into an open tank and aged soy sauce stock mash with the addn. of a sufficient amt, of NaCl to keep a favorable salty taste of soy sauce. By this process, the brewing period is shortened markedly without deterioration by bacteria, and increased portions of the protein and carbohydrates in the raw materials become available in the obtained soy sauce.
CA, V. 52, 1958: 9514b

ISHIGAKI, R.; NAGASE, I.
Semi-chemical soy sauce. I. Variation of common components and the distribution of nitrogenous compounds in the semi-chemical soy sauce process. (Tokyo Agr. Coll.). Nippon Jozo Kyokai Zasshi 1963, 58(3), 325-7, 330.

Defatted soybeans (1000 kg) were hydrolyzed with 2.5 times their wt. of 7% HCl at 90° for 40 hrs., and neutralized with Na_2CO_3 to pH 5.5. This hydrolyzate was added to a mash prepd. from wheat koji, and the mixt. was ripened at 27°. The variations in d., pH, color, and contents of N-contg. fractions, sugars and dextrin in the mash were estd. during the process at 15-day intervals. Sol. N-compds. were fractioned into 4 fractions by pptn. with $Cu(OH)_2$, K_2HGI_4, and $Pb(OAc)_2$, and distribution of N in these fractions was estd. The distribution of N in the soybean hydrolyzate was: protein 3.56, protease 5.71, peptone 14.93, and amino acids 76.49%; the distribution in mash after 60 days was, resp.: 2.01, 4.09, 11.96, and 81.80%. Most of the high-mol. wt. N-compds. in mash were changed to low-mol. wt. at the latter stage of fermentation.
CA, V. 61, 1961: 6278g

ISHIGAKI, R.; NAGASE, I.
Semi-chemical soy sauce. II. Oxidation-reduction potential in the semi-chemical soy sauce process. Nippon Jozo Kyokai Zasshi 1963, 58(3), 390-1.

Oxidn.-redn. potential was measured during the process. Neutralized soybean hydrolyzate showed lower values of rH than that of the mash at early stages. Values for the mash showed a tendency to decrease gradually during the process until the 45-day period and to increase slightly at the 60-day period. rH values of neutralized soybean hydrolyzate were 11.77-11.94, and those of the mash were: 15.40-15.73, 14.79-15.42, 13.94-14.49, and 14.07-14.43, resp., 15, 30, 45, and 60 days after mashing.
CA, Vo. 61, 1964: 6278h

KAO, C

Fermented foods from chickpea, horsebean, and soybean. (Kansas State Univ., Manhattan, Kans.). 1974. 143 pp. (Eng). Avail. Xerox Univ. Microfilms, Ann Arbor, Mich., Order No. 74-25,608. From Diss. Abstr. Int. B 1974, 35(5), 2250.
CA, V. 82, 1975: 84737z

LUKSAS, A.J.; WILLIAMS, W.

Soy sauce. (Beatrice Foods Co.) U.S. 3, 711, 303 (Cl. 99-145; A 23l), 16 Jan 1973, Appl. 36, 427, 11 May 1970; 6 pp.

Soy sauce is produced in a relatively short time by fermenting maromi with an inoculant selected from Saccharomyces and Debaryomyces of a maromi isolate. To illustrate, a conventional koji was prepd. by boiling in water for 15 min 8.75 lb soybeans, roasting for 1 hr in a rotating oven at 250°F 8.75 lb soybeans and roasting for 1 hr in a rotating oven at 250°F 17.5 lb wheat. The boiled soybeans, roasted soybeans, and wheat were mixed, and ground until all particles has a size of ≤ 10 microns. To the resulting ground mixt. was then added 0.1 g dry powd. koji culture and it was fermented 5 days at 82°F. The koji was placed in 167 lb sterilized 18% aq. NaCl, and mixed. With mixing, 13 ml of inoculant in 18% saline was added to the slurry. The inoculant contained approx. 1×10^{10} organisms of Saccharomyces rouxii. N was flushed through the head space of approx. 2 ft^3 at 10 ml/min. The slurry was maintained at 80-4°F. The conditions were maintained for 5 days, with a 15-min stirring every 4 hr. After the 5-day period, the N flush was stopped every 4 hr and replaced by an air flush for 15 min, with stirring during the flush and with stirring for 15 min after the air flush was completed and N was again flushed through the head space. After each aeration, the N flush was resumed and continuously maintained. The above temp. conditions, N and air flushing schedule was continued for 21 days beyond the initial 5-day fermn. period. The liq. was sepd. by means of a conventional filter press. The liq. had the color and aroma of soy sauce. The taste was that of a good soy sauce with medium body. The soy sauce was aged for 2 weeks in a stainless steel closed vat and the flavor developed into a very full-bodied soy sauce.
CA, V. 78, 1973: 134717h

LUKSAS, A.J.; WILLIAMS, W.

Soy sauce. (Beatrice Foods Co.) U.S. 3,878,302 (Cl. 426-46; A 23), 15 Apr 1975, Appl. 36,427, 11 May 1970; 7 pp. Division of U.S. 3,711,303 (CA 78;134717h).

Soy sauce is produced in a short time by a fermentable compn. consisting of a mixt. of koji or maromi with a yeast. Thus, a koji was prepd. by mixing 8.75 lb soybeans boiled for 15 min with 8.75 lb soybeans roasted for 1 hr at 250° F and 17.5 lb wheat roasted at 250° F for 1 hr. The mixt. was ground to a particle size of < 10 µ. The ground mixt. was mixed with 0.1 g dry koji culture and allowed to ferment 5 days at 82° F. This koji ferment was slurried with 167 lb 18% NaCl. With mixing, 13 ml inoculant contg. 1×10^{10} Saccharomyces rouxii in 18% NaCl was added. N was flushed through

the head space of the vessel, and the temp. was kept at 80-4° F for 5 days. Thereafter the N flush was stopped every 4 hr and replaced with an air flush for 15 min. The alternate flusing was continued for another 21 days. The liq. soy sauce was sepd. from the solids by a filter press, and it was aged 2 weeks in a stainless steel vat to develop a full-bodied, good tasting sauce.
CA, V. 83, 1975: 95192q

MARTASASMITA, S.; WINARNO, F.G.; et al.
Pengaruh jenis kapang, waktu fermentasi dan varietas kacang kedele terhadap mutu kecap (The effect of mold varieties, length of fermentation and soybean varieties on the quality of soy sauce (kecap).

In these studies two varieties of mold e.i. A. oryzae and R. oryzae have been used to prepare the Indonesian soy sauce called kecap made from three local varieties of soybean e.i. No.452, 1338 and 1343, at different fermentation time of 30, 40 and 50 days. The results indicate that fermentation of 40 days produced "kecap" with the highest total nitrogen and soluble nitrogen. However, 50 days fermentation produced high soluble solid, low pH (6.00), darker in colour and taste better according to the panelist. Local soybean variety of 452 produced "kecap" with higher total nitrogen and soluble nitrogen than others. A. oryzae produced "kecap" with higher of total nitrogen, soluble nitrogen, soluble solid and viscocity than of R. oryzae.
Bull. Penelit. Tek. Has. Pert., 1975, 12, 15-31.

MASLOV, V.G.
Fermentation of soybeans and similar proteinaceous materials.
U.S.S.R. 68,061, Mar. 31, 1947.

Soybeans, prepd. as usual, are steamed for 1-6 hrs. and then transferred into fermentation vats. In the latter, the mass is fermented by lactic acid bacteria and Aspergillus oryzae in a liquid medium at 32-40°. During fermentation sterile air is blown through the fermenting material. The starter is prepd. by cultivating Aspergillus oryzae on cooked rice or barley groats at 32° for 4-5days, and then dilg. it with sterilized mash.
CA, V. 43, 1949: 3562b

MENEZES, DE; TOBIAS, J.B.
Foods and sauces obtained by fermentation of soybeans and grains. (Brazil). Bol. Inst. Tecnol. Aliment., Sao Paulo 1972, (31), 49-63 (Port).

Review of fermn. processes for prepn. of shoya, miso, natto, tempeh, and sufu from soybean with wheat, rice, and other cereal grains.
CA, V. 78, 1973: 122692h

MINOR, L.J.
Soy-sauce processes and how they can be improved. Food Industries 1945, (17), 758-60.

The prepn. of soya by both the mold-enzyme and acid-hydrolysis methods in described.
CA, V. 39, 1945: 5634^6

MOGI, M.

Miso and soy sauce. Amino acid fermentation and nucleic acid-related substances. (Noda Soy Sauce Co., Noda, Japan). Nippon Jozo Kyokai Zasshi 1963, 58(3), 285-302.

A review with 352 references.
CA, V. 61, 1964: 4876^{c}

MOGI, M.; IGUCHI, N.

Soy sauce and fermented soybean paste in 1956. (Noda Ind. Sci. Research Lab., Chiba). Nippon Jozo Kyokai Zasshi 1957, (52), 109-16.

A review with 87 references.
CA, V. 51, 1957: 17080g

MOGI, M.; IGUCHI, N.

Studies on soy sauce, miso, amino acid fermentation, and nucleic acid-related substances in 1964. (Inst. Ind. Res., Noda, Japan). Nippon Jozo Kyokai Zasshi 1965, 60(3), 218-39 (Japan).

A review with 440 references.
CA, V. 63, 1965: 13945f

MORIMOTO, S.

A quick ripening process of soy sauce. I. A new quick ripening process based on alcohol fermentation. (Shoin Jr. Coll., Kobe, Japan). Hakko Kogaku Zasshi 1962, (40), 539-54.

Defatted soybean with or without wheat bran was hydrolyzed with Na_2CO_3 to pH 5.0 to yield a saccharified soln. contg. reducing sugar 3.0-5.4, total N, 0.5-1.0, and NaCl 3.65-8.41 g./100 ml. Keeping this with pressed yeast at 28° for 3-4 days gave a liquor with a soy sauce-like flavor. Keeping it 30 days at 30° with the addn. of soy sauce koji gave an excellent soy sauce with 1.24-1.72 g. total N/100 ml. and 0.48-0.76 g. amino N/100 ml., and with an excellent flavor.
CA, V. 62, 1965: 15350g

MORIMOTO, S.; MURAKAMI, M.

A quick ripening process for soy sauce. V. A new quick ripening process based on alcohol fermentation. A qualitative analysis of soy sauce flavor components using gas-liquid chromatography. (Shoin Junior Coll., Kobe, Japan). Hakko Kogaku Zasshi 1966, 44(8), 467-75 (Japan).

Meckes ether-pentane extn. method was used for the extn. of the flavor components. Polyethylene glycol (P.E.G.) 300 and sucrose acetate isobutyrate (S.A.I.B.) were used for the liq. phase at 90° for the low-boiling components, and S.A.I.B. and diethylene glycol succinate (D.S.) and Hyprose were used at 150° for the high-boiling components. The flavor components such as isoamyl alc., n-butyl acetate, ethyl maleate, ethyl levulinate, and ethyl caprate, were detected in at least 2 or more columns. The other components, i.e., ethyl alc., ethyl acetate, n-propyl alc., isobutyl alc., n-butyl alc., acetic acid, butyric acid, ethyl lac-

tate, furfurol, 2,3-butyleneglycol, benzaldehyde, methionol, ethyl succinate, ethyl benzoate, β-phenylethyl alc., ethyl isovalerate, isobutylaldehyde, isopropyl alc., and diacetyl were detected in at least 2 or more columns of the above 4 columns. A large peak relating to an unknown component, of which the relative retention time in S.A.I.B. column at 150° was 0.398, was found in soy sauce based on alc. fermentation but was not found in com. soy sauce. The contents of the various flavor components in soy sauce based on alc. fermentation were very different from the com. soy sauce.
CA, V. 69, 1968: 9763h

MORIMOTO, S.; MURAKAMI, M.
A quick ripening process for soy sauce. VI. A new quick ripening process based on alcohol fermentation. A quantitative analysis of the flavor components using gas-liquid chromatography. (Shoin Junior Coll., Kobe, Japan). Hakko Kogaku Zasshi 1966, 44(8), 476-82 (Japan).

The contents of the flavor components in soy sauce based on alc. fermentation, as well as its control, a com. soy sauce, alc. fermented soln., and a converted soln. were analyzed using gas-liq. chromatog. Polyethylene glycol 300 was used for the liq. phase at 90° for the low-boiling components and sucrose acetate isobutyrate was used at 150° for the high-boiling components. In the quant. anal. the internal standard method was used and the following results were obtained. The contents of isoamyl alc., benzaldehyde, furfurol, 2,3-butylene glycol, β-phenylethyl alc., and the total amt. of the flavor components were more abundant in soy sauce based on alc. fermentation than in the com. soy sauce. The contents of isoamyl alc., β-phenylethyl alc., methionol, and 2,3 butylene glycol were more abundant in soy sauce based on alc. fermentation than in its control. The content of furfurol in converted soln. was 94% of the total amt. of the flavor components, while the values of furfurol decreased rapidly and a great amt. of benzaldehyde and isoamyl alc. was produced when the converted soln. was fermented by yeast.
CA, V. 69, 1968: 9764j

MORIMOTO, S.; OHASHI, M.
A quick ripening process for soy sauce. VIII. A new quick ripening process based on alcohol fermentation; furfural and furfuryl alcohol in various types of soy sauces. (Shoin Junior Coll., Kobe, Japan). Hakko Kogaku Zasshi 1968, 46(5), 356-61 (Japan).

The formation of furfuryl alc. and furfural in com. soy sauce, and in raw soy sauce, Shinshiki No. 2 soy sauce and amino acid soy sauce were detd. by gas-liquid chromatog. Polyethylene glycol (P.E.G. 300) was used for low-b.p. components at 90° and sucrose acetate isobutyrate (S.A.I.B.) for high-b.p. components at 150° as the liq. phase. For their quant. anal. the internal standard method was used, and the following results were obtained: furfuryl alc. was found in the above 4 samples and it was abundant particularly in Shinshiki No. 2 soy sauce, namely, 246-354 µl/l.; furfural was a component of the odor in the acid hydrolyzate of

defatted soybeans or wheat bran at the rate of 58-94% of the total components of the odor. The unpleasant smell caused by HCl hydrolysis disappeared when furfuryl, ethyl, isoamyl, and isobutyl alcs. and EtOAc were produced by fermentation; the furfural content was 87-1140 µl./l. when defatted soybeans were treated with 6% HCl. Methylfurfural and furfuryl alc. were also produced. A large peak relating to Et levulinate was found when the defatted soybeans were treated with 12-20% HCl.
CA, V. 69, 1968: 58466x

MORIMOTO, S.; SAKAGUCHI, Y.
Quick ripening process of soy sauce. III. The relations between the change of alcohol concentration, pH, and temperature and the quality of the quick-ripened soysauce. (Shoin Jr. Coll., Kobe, Japan). Hakko Kogaku Zasshi 1963, 41(11), 553-8 (Japan); cf. CA 62, 15350g

Liberation of the extractable matter of koji was not inhibited by alc. when the initial concn. of alc. added was below 3%, and the process involving addn. of alc. gave products with improved flavor and other qualities. The optimum mash pH was 6-7.
CA, V. 64, 1966: 1270e

MORIMOTO, S.; SAKAGUCHI, Y.; et al.
Quick ripening process of soy sauce. VII. A new quick ripening process based on alcohol fermentation. The composition of organic acids. (Shoin Junior Coll., Kobe, Japan). Hakko Kogaku Zasshi 1967, 45(1), 17-21 (Japan).

The compn. of org. acid in soy sauce based on alc. fermentation, as well as its control, a com. soy sauce, and soy sauce based on a converted soln. or alc. soln., was analyzed by partition chromatog. using silica gel. The content of oxalic acid was more abundant in soy sauce based on alc. fermentation than in the com. soy sauce. The content of malic acid was more abundant in the control based on the converted soln. and the soy sauce based on alc. fermentation than in the control of normal mash and soy sauce based on alc. soln. The abundance in malic acid content was probably caused by using the converted soln. The content of lactic acid was less in soy sauce based on alc. fermentation than in its control and the com. soy sauce. The acidified soy sauce based on alc. soln. was due to lactic acid, and its content was 80-88% of the total amt. of the org. acids.
CA, V. 69, 1968: 9726y

NASUNO, S.; OKADA, H.
Fermentation of soy sauce, miso, glutamic acid, and nucleic acid-related substances. (Noda Inst. Ind. Sci., Noda, Japan). Nippon Jozo Kyokai Zasshi 1974, 69(5), 283-301 (Japan).

A review with 604 refs. published in Japan in 1973.
CA, V. 81, 1974: 103166k

OGATA, M.

The color of soy sauces prepared from different raw materials. (Pref. Ind. Expt. Sta., Kumamoto). Nippon Jozo Kyokai Zasshi 1958, 53, 76-8.

Soy sauces were prepd. from single or combined use of defatted soybean meal, wheat, and rough meal of wheat (residue from wheat flour). Soy sauces in the initial stage of fermentation showed colors low in yellow to orange tints and rich in violet to indigo; the colors tended to reverse as fermentation proceeded. The proteinaceous raw material (soybean) appeared to be responsible for red to violet tints, while the carbohydrate raw material (wheat) appeared to be responsible for yellow to orange tints. The colors were measured with a colorimeter with 470, 500, 530, 570, and 610 mμ filters.
CA, V. 55, 1961: 7753i

OHTANI, T.; HAMATA, Z.

White soybean sauce. (Shin Shin Food Industrial Co., Ltd.). Japan. 71, 18,598 (Cl. C 12x), 24 May 1971, Appl. 67 29,471, 11 May 1967; 3 pp.

Hydrolyzed protein solns. were treated with weakly basic anion-exchange resins and decoloring resins and fermented with malts. Thus, 50 kg defatted soybeans were mixed with 3.8 kg of 35% HCl, heated 12 hr at 118°, the filtrate (3 g/dl total N) (11.6 l.) was passed through 15 l. Amberlite IRA-93 (treated with 15 l. of 5% aq. NaOH) and then 15 l. Centranol W-291 (treated with 15 l. of 1% HCl), concd. in vacuo, and the NaCl-adjusted soln. (18.5 g/dl NaCl) (7.5 l.) mixed with 7.5 l. aq. NaCl (23 g/dl. concn.) and 9.4 kg malt, fermented 2 months, and fermented further 1 month with 56 l. aq. NaCl (19 g/dl concn.) to give 15 l. white soybean sauce.
CA, V. 77, 1972: 33144t

ONISHI, H.

Results of studies on soy sauce and miso, together with fermentative production of glutamic acid, and nucleic acid-related substances. (Noda Inst. Ind. Sci., Noda, Japan). Nippon Jozo Kyokai Zasshi 1968, 63(3), 342-59 (Japan).

A comprehensive review of results published in Japan in 1967. 470 references.
CA, V. 69, 1968: 95043c

ONISHI, H.

Review of studies on soy sauce and miso, together with fermentative production of glutamic acid and nucleic acid-related substances. (Noda Inst. Ind. Sci., Noda, Japan). Nippon Jozo Kyokai Zasshi 1972, 67(4), 334-52 (Japan)

A comprehensive review of results published in Japan in 1971. 592 refs.
CA, 77, 1972: 150610c

ONISHI, H.

Review of studies on soysauce and miso, together with fermentative production of glutamic acid and nucleic acid-related substances. (Noda Inst. Ind. Sci., Noda, Japan). Nippon Jozo Kyokai Zasshi 1973, 68(4), 265-86 (Japan).

A review of results published in Japan in 1972. 653 refs.
CA, V. 79, 1973: 40858y

SHARYPOVA, A.O.

The effect of the acidity of soybean must on its fermentation. Trudy Tsentral. Nauch.-Issledovatel. Lab. Perebotke Soi, Poluchenie Produktov Fermentatsii i ikh Ispo'zovanie 1939, (3), 16-7; Khim. Referat. Zhur. 1940, (8), 130.

Max. growth of Aspergillus oryzae occurs at pH 5.0-5.8, of Bact. mesenthericus at pH 7.2-7.4. Expts. under semiproduction conditions at pH 6.4, the amt. of spore-bearing rods of Bact. mesenthericus was twice as great as at pH 5. The product is thinner, but the taste is impaired.
CA, V. 36, 1942: 7225^7

SHIMIZU, R.; NAKAYA, Y.

Addition of aroma to soy sauce. Japan. 1958, 37, 96, May 16.

Amino acid soy sauce (9 cu.m.) contg. N 1.7, extractives 21.3, and salt 16.6% is treated by adding following aromas before or during the fermentation: $4,1,2\text{-Et(HO)(MeO)}C_6H_3$ 50, AcH 30, $Me(CH_2)_3CHO$ 80, $Me(CH_2)_4CHO$ 10, $MeCH(SMe)CH_2OH$ 60, $MeSCH_2CH_2OH$ 10, AcOEt 60, $Me(CH_2)_3CO_2Et$ 60, $Me(CH_2)_4CO_2Et$ 15, Et vanillate 5, BzOEt 40, vanillin 5, PhCHO 10, furfural 40, $MeCH(OEt)_2$ 40, $Me_2CHCH_2CH(OEt)_2$ 50, and $Me_2CHCH_2CH_2CH(OEt)_2$ 10 ml.
CA, V. 53, 1959: 5586c

TENBATA, M.; MORINAGA, T.

Fermenting ability and the refined degree of soy moromi by addition of chemical soy sauce. Hiroshima-Ken Shokuhin Kogyo Shikenjo Hokoku 1968, (10), 37-44 (Japan)

Taste of chem. soy sauce (amino acid mixt.), prepd. from acid hydrolyzates of soybean, was improved by brewing for 10-30 days with 3-5 vols. of soy mash (moromi).
CA, V. 71, 1969: 100611j

YOKOTSUKA, T.

Recent technological problems related to the quality of Japanese shoyu. (Cent. Res. Lab., Kikkoman Shoyu Co., Ltd., Noda, Japan). Ferment. Technol. Today, Proc. Int. Ferment. Symp., 4th 1972, 659-62 (Eng). Edited by Terui, Gyozo. Soc. Ferment. Technol., Jpn.: Osaka, Japan.

A review with 40 refs., on the chem. compn. and manuf. of shoyu and problems assocd. with its manuf.
CA, V. 84, 1976: 29244c

d. Nutritive Values

ADRIANO, F.T.; OLIVEROS, S.B.; et al.
The physical characteristics and chemical composition of various brands of toyo (soy sauce) sold in the Philippines. Phil. J. Agriculture, 1934, 5:171.

The taste was either fair or good, but the odor ranged from poor to very good. Upon diluting fifty times, the samples gave clear brown color; some were cloudy or turbid. The sp. gr. at 25°C varied from 1.975 to 1.3045, the moisture from 53.96 to 70.96 per cent. Twenty-one samples gave the following average chemical composition one: Total solids, 37.31; total ash, 22.02; protein, 4.56; ether extract, 1.33; reducing sugar, 9.27; sucrose, 0.59; starch, 0.90;NaCl, 19.90. Nutr. Related Topics, 1953: 8

AKABORI, S.
Aroma of shoyu (soy sauce). I. J. Chem. Soc. Japan 1936, 57, 828-31.

Distn. of 1981. soy sauce at 70-200 mm. by passing CO_2 and ether extn. of the distillate gives 144 g. consisting mostly of EtOH with less AcOEt and isovaleraldehyde. The residue (10.7 g.), after removal of EtOH and acid, gives 22.6% furfural and small amt. of acetoin.

II. Isolation of (γ-methylmercapto) propyl alcohol and its synthesis. Shiro Akabori and Takeo Kaneko. Ibid. 832-7.

Soy sauce was distd. below 60° at 2-30 mm. and the distillate was collected by condensing it in ice. The fractions b_{15} 63-87° and b_4 74-88° gave the strongest aroma. They were shown to be (γ-methylmercapto) propyl alc. (I); the m.p. of the Hg-Cl_2 salt, $C_5H_{12}O_2S$. $3HgCl_2$, 275.5-8.5°, was not lowered by a pure specimen prepd. by synthesis. I itself has not so agreeable an aroma but when added (0.0005-0.001%) to the sauce it increases the characteristic aroma. I is probably produced by the fermentation of methionine.
CA, V. 31, 1937: 1355^2

AKABORI, S.; KANEKO, T.
Aroma of shoyu. III. β-methylmercaptopropionaldehyde. J. Chem. Soc. Japan 1937, 58, 236-7; cf. C.A. 31, 1355^3

$MeSCH_2CH_2CHO$ (I), prepdn from $MeSCH_2CH_2CH{:}(OEt)_2$, has a shoyu like aroma. The aroma of shoyu is not exclusively derived from I, but I and $MeSCH_2CH_2CH_2OH$ (II) seem to be most important in the production of the aroma. I and II are probably derived from $MeSCH_2CH_2CH(NH_2)CO_2H$.
CA, V. 31, 1937: 3201^7

AKINRELE, I.A.
Fermented food compositions. (Federal Institute of Industrial Research) Brit. 1,193,135 (Cl. A 23ℓ), 28 May 1970, Appl. 27 Nov 1967; 4 pp.

A food compn. is prepd. by (A) steeping a starchy material in water until the microflora is dominated by lactobacilli, wet milling in the steep water or other water to form a slurry, (B) soaking a dried and dehulled leguminous material in water and wet-milling to form a leguminous slurry, there being added, at least in the case where the steep water is not employed in wet-milling of A, lactobacilli and optionally one or more of the organisms Candida mycoderma, Aerobacter species and Saccharomyces species, and (C) mixing A and B and allowing them to ferment at 18-45°, then dewatering or drying. Thus, maize grains were washed, then steeped in twice their wt. of water for 24 hr at 30-32°. The steeped maize was milled in its own water until 75% extn. through a 72 BSS mesh was obtained. Soybeans were cleaned and air dried at 90° to a moisture content of 10%, dehulled, then soaked in water for 1-2 hr and wet-milled as above. The maize and soy slurries were mixed in proportion 70:30 resp., allowed to ferment at 30-32° until the acidity was such that 5 ml of clear liquor was neutralized by 35 ml 0.01N NaOH. $Na_2S_2O_5$ was added to give a concn. of 200 ppm dissolved SO_2 and to destroy the urease and antitryptic factors of soybeans. Mineral and vitamin additives were mixed into the fermented slurry and then spray or flash dried to a moisture content of 3%. The food compn. may then be flavored, colored, graded, and packed and is high in nutritonal value with no beany flavor.
CA, V. 73, 1970: 65203v

AMANO, T.
Aromas in soybean miso and Tamari soy sauce. V. Composition of aroma components in the head space vapor from various soy sauces. Aichi-Ken Shokuhin Kogyo Shikensho Nempo 1974, 15, 20-8 (Japan).

The compds. were detd. in the head space vapor (HSV) from regular soy sauce, light-flavor soy sauce, Tamari soy sauce and white soy sauce by gas chromatog. Peaks from regular and light-flavored soy sauces were much higher than those from Tamari and white soy sauces; e. g., the EtOAc [141-78-6] content in regular soy sauce was 91-fold greater than that in white soy sauce, and the EtOH [64-17-5] content in regular soy sauce was 94-fold greater than in Tamari soy sauce. Acetic acid [64-19-7] was the main volatile acid in various soy sauces, and EtOH and EtOAc contents in HSV were pos. correlated with those in the sauce.
CA, V. 84, 1976: 29386a

ANON
Odorous components of brewed shoyu and chemical shoyu. Kagawa-ken Shoyu Shikenjo Hokoku 1954, (48), 4-7.

EtOH, volatile aldehydes, and volatile esters were detd. in a no. of shoyu samples. Brewed shoyu was richer in them than chem. shoyu. Volatile components, especially EtOH, decreased by heat sterilization.

Heat sterilization of shoyu. Ibid. 1957, (49), 46-56.
Changes of color and pH correlated well with odors of heat-sterilized shoyu. Prevention of EtOH loss on heating gave good results.
CA, V. 53, 1959: 10654i

ASA ASAO, Y.; SAKASAI, T.; et al.
Flavoring substances in shoyu. XXVI. Flavoring components produced by yeast fermentation. 2. (Kikkoman Shoyu Co., Ltd., Noda, Japan). Nippon Nogei Kagaku Kaishi 1967, 41(9), 434-41 (Japan).

Compn. of steam-volatile phenols of shoyu mash fermented by yeast was exmd. 4-Ethylguaiacol, 4-ethylphenol, and 2-phenylethanol were detected by thin-layer chromatog. These alcs. were purified as cryst. prepns. and identified by ir absorption spectra. Ferulic acid and p-coumaric acid increased the formations of 4-ethylguaiacol and 4-ethylphenol, rsp. Of various genera and species of yeasts isolated from shoyu mash, only Torulopsis species produced these alkylphenols during the fermentation. 2-Ethylphenol was a common product of yeast fermentation.
CA, V. 68, 1968: 86265d

ASA ASAO, Y.; YOKOTSUKA, T.
Flavoring substances in soy sauce. XXIII. α-Diketones in soybean sauce. (Soy Sauce Co., Ltd., Noda, Japan). Nippon Nogei Kagaku Kaishi 1963, 37(10), 563-8 (Japan); cf. CA 62, 16886a

The amts. of volatile α-diketones (I) in mature soybean sauce was 0.05-0.1 mg. %.

XXIV. α-Diketones in soybean sauce. 4. Ibid. 569-75.

Acetoins in the soybean sauce mash during its prepn. were detd. by Hooreman's method (CA 44, 6466b), and it was found that the amt. of acetoins varied with the activity of yeasts in the mash; the max. amt. was ∿ 25 mg. %.
CA, V. 63, 1965: 7576b

ASA ASAO, Y.; YOKOTSUKA, T.
Components of soy sauce. IV. Aroma components. (Kikkoman Shoyu Co. Ltd., Noda, Japan). Nippon Jozo Kyokai Zasshi 1967, 62(10), 1106-17 (Japan).

Flavor substances in soy sauce, including alcs., esters, carbonyl compds., acetals, phenols, and S-contg. substances, are described. Their properties and contents in soy sauce are given. 87 references.
CA, V. 68, 1968: 67766b

CHE CHERL, H.L.
Studies on the amino acid composition of Korean fermented soybean Meju products and the evaluation of the protein quality. Kor. J. Food Sci. Technol. 1973, 5 (4), 210-214. (Article in Korean)

This study analyses and compares the amino acid composition and available lysine content between Korean fermented soybean Meju and its products as well as home-made and commercially made products. The protein quality of the products was evaluated by the result, and the biological value of the protein was estimated by using the regression equation for chemical score to biological value as calculated by B.O. Eggum. The amino-N content of soybean is found to be 85% of the total nitrogen content and is reduced

to approximately 75% in the fermented products except home-made soysauce, whereas the content of ammonia-N and other N-compounds is increased. The difference in protein quality between home-made and commercially made products is not found to be significant. The protein quality of soybean is not damaged greatly in the making of Meju but is seriously damaged during the long periods of ripening. After the ripening the chemical score of the products' protein is reduced to approximately one half of the original soybean protein and the available lysine content to 1/3—1/2.
Korean Sci. Abstr., V. 6 (1) 1974: 130

CHERL, H.L.
The effect of Korean soysauce and soypaste making on soybean protein quality (1). Chamical changes during Meju making. Kor. J. Food. Sci. Technol. 1976, 8 (1), 12-18. (Article in Korean)

Fermented soybean Mejus were prepared in the laboratory with varying lengths of fermentation and the changes in the chemical composition during the Meju making were determined. The moisture of cooked soybean was gradually evaporated during the Meju fermentation, and after 2 months of fermentation the water level reached to the level of the raw soybean. The concentrations of crude fat, crude protein and ash of the dry matter of soybean did not change considerably during soaking, cooking and Meju fermentation of up to 3 months, whereas carbohydrates decreased significantly during soaking and Meju fermentation. The percentage retention of the nutrients were 58% for carbohydrates and 93% for crude fat and crude protein. The nitrogen solubility of soybean decreased drastically during cooking, from 79% to 21%, while Meju fermentation increased it to approximately 30% in the first week and this level remained constant for the duration of the fermentation. The concentration of free amino nitrogen in total nitrogen of soybean decreased during cooking, from 7% to 3%, but fermentation of Meju liberated it to the level of raw soybean. The concentration of free amino-nitrogen in the total-N of soybean was increased by cooking and further increased during Meju fermentation. The amino acid pattern of soybean did not change significantly during soaking, cooking and the Meju fermentation up to 3 months. Serine and the basic amino acids, lysine, arginine and histidine, decreased to the range 81 87% of the raw soybean during the first month of Meju fermentation and thereafter remained almost constant. The total amino acid per 16g nitrogen was 99g in cooked soybean and 93g in 1 month Meju, indicating a 6% reduction.
Korean Sci. Abstr., V. 8 (3) 1976: 421

CHERL, H.L.
The effect of Korean soysauce and soypaste making on soybean protein quality (2). Chemical changes during Meju-brine ripening. Kor. J. Food Sci. Technol. 1976, 8 (1). (Article in Korean)

The laboratory Mejus as well as home-made Meju and improved Meju received from Korea were ripened in the brine for up to 8 months and the changes in the chemical composition during the process

were determined and the differences between the types of Meju were compared. On the basis of the amino acid pattern, the changes in the protein quality of soybean during the process was evaluated No significant changes in the general chemical composition of Meju were noticed during the ripening for 8 months. However, the nitrogen solubility of Meju increased for 13∼29% to 66∼78% during 8 month ripening of the Meju-brine mixture. The concentration of free amino-N to the total- N increased from 4∼7% in Meju to 29∼35% in the 8 month ripened mixture. The concentration of amino-N to the total-N increased from 1∼4% in 5∼14% in Meju to 5∼14% in the 8 month ripened mixture and the changes varied with the type of Meju used. Remarkable changes in the amino acid pattern of soybean occurred during the ripening process. The concentration of methionionine decreased to the half of original Meju during the first month of ripening. Arginine and histididine were destroyed rapidly by the ripening longer than 1 month. A considerable amount of ornithine was synthesized during the ripening. The amino acid pattern of Meju did change drastically during the ripening longer than 3 months and the changes varied with the type of Meju. The retention of nutrients in soybeans in soybean during 8 month ripening of the laboratory 3 month Meju in the brine was 49% for carbohydrates, 107% for crude fat, 93% for crude protein and 74% for the total amino acid, Histidine arginine and methionine and 74% for the total amino acid. Histidine, arginine and methionine were the most damaged during the process, retaining only 25%, 27% and 49% of the contents in raw soybean, respectively, whereas lysine retained 79%. By the separation of the 8 month ripened mixture, approximately 60% of crude protein, all of crude fat and 80% of carbohydrates in the mixture were retained in soypaste. Soypaste contained higher concentrations of amino acids per 16gN compared to soysauce, except for lysine. The most limiting amino acid of the protein was the S-containing amino acids in all cases studied, whereas the second limiting aminoacid varied from valine in soybean to threonine in most of Mejus and the brine mixtures, lysine in most of soypastes and tryptophan in some of soysauces. According to the protein quality evaluation made by the reference of the FAO provisional pattern of amino acid, the chemical score of raw soybean was 82, which was reduced to 77 by cooking and further reduced to 71 74 by Meju fermentation. At the eight of ripening the chemical score of the Meju-brine mixtures were reduced to 51∼56. After the separation, the chemical score of soypaste ranged from 60 to 71, whereas that of soysauce varied from 45 to 57. Generally, the products made from improved Meju recorded the highest score, whereas those made from homomade Meju showed the poorest protein quality. The essential amino acid index (EAAI) of the samples was similar to the chemical score, but it appeared to fit the overall changes in the amino acid pattern during the process better than the chemical score.
Korean Sci. Abstr., V. 8 (3) 1976: 422

CHERL, H.L.

The effect of Korean soysauce and soypaste making on soybean protein quality (3). Changes in the lysine availability. Kor. J. Food Sci. Technol. 1976, 8 (2), 63-69. (Article in English)

The changes in lysine availability during soybean fermentation were determined by the chemical analysis method as well as the biological methods with rat. The FNDB-reactive lysine determined by the difference (TLMI) method indicated that cooking and Meju fermentation reduced the lysine availability of soybean, but the subsequent ripening restored the availability to the same level of the raw soybean. On the other hand, the Biological Value, NPU, NER and the Relative lysine availability of the rat experiments showed a general decrease in the lysine availability of soybean during the ripening process as well as Meju fermentation.
Korean Sci. Abstr., V. 8 (6) 1976: 819

CHERL, H.L.

The effect of Korean soysauce and soypaste making on soybean protein quality (4). Protein supplementary effect on soybean products to the rice diet. Kor. J. Food Sci. Technol. 1976, 8(3), 121-128. (Article in English)

Cooked soybean, soybean curd, soymilk residue and fermented soybean Meju products were prepared in the laboratory and the protein supplementary effect of these foods to the rice diet was determined by the rat feeding experiments. The soybean products providing 20% of the dietary protein were added to steamed rice and the protein digestibility (TD), Biological Value (BV), NPU, PER and Partial Carcass Nitrogen Value of the diets were measured. The protein supplementary effect of soybean products indicated that the non-fermented products generally improved the protein quality of the rice diet, whereas the fermented products did not but reduced it in some cases. There was observed a possible antinutritional effect for the diet supplemented with Home-made Meju. This growth regarding effect of Home-made Meju disappeared during the subsequent ripening in the brine for 6 months.
Korean Sci. Abstr., V. 8 (6) 1976: 820

CRUZ, MAYDA B. de la; MALABON, R.

Determination of the protein content of soy sauce (toyo) prepared from different local materials. Araneta University, 1963. 15p. 6 refs. (Thesis. B.S. major in Food Technology)

Soy sauce was prepared by fermenting with Aspergillus oryzae the following materials: soybean-wheat, soybean meal-wheat, copra meal-wheat, soybean-wheat bran, rice bran-soybean meal and mongo bean-rice bran. Fermentation was allowed for 2-4 mo. Except for the sauce prepared from rice bran-soybean meal, all gave higher protein content (12.181-23.284%) than the commercially prepared soy sauce which gave a maximum of 8-9% protein. The sauce prepared from wheat-soybean gave the highest protein content. It was noted that longer fermentation effected a better characteristic flavor.
Phil. Abst. 1970. V. 4 (2), 1963: 212.

EBIHARA, K.
Synthetic aroma for soy sauce. Japan. 5250('54), Aug. 21.

The aroma is composed of Pr adipate and Pr propionate (100:60-6 by vol.), to which the following substances are added: Methionol (3-(methylthio)-1-propanol) 10, C_{14} aldehyde 31-64, vanillin 13-20, HCO_2Et 38-66, and AcOEt 20-33 parts by wt.
CA, V. 49, 1955: P.13552d

FUJITA, M.; HAMADA, S.; et al.
Aromatizing of soy sauce and other seasoning materials. Japan. 14, 485('60), Oct. 3.

Soy sauce (100 ml.) is treated with 0.0001 ml. $PhCH_2COCH(OEt)_2$ (I), b_{0-3} 107-10°, or 0.01 ml. of 1% alc. soln. of I.
CA, V. 55, 1961: P:3872b

FUJIWARA, K.; TANAKA, S.; et al.
Amino acids in soy sauce. I. Contents of amino acids in different soy sauces. (Univ. Osaka, Japan). Hakko Kogaku Zasshi 1962, 40, 321-7.

Soy sauces of different makes were analyzed for 10 representative amino acids by microbial assay technique.

II. Changes of the amounts of main amino acids during ordinary mash process. Kozo Fujiwara, Mutsumi Tokuda, and Atsuko Namba. Ibid. 327-32.

Free arginine was lost considerably during the mash process of soy sauce manufd. by the brewing method. Isoleucine, leucine, methionine, and phenylalanine kept increasing during 396 days from the start of the process while glutamic acid, glycine, lycine, and valine showed max. in this period.
CA, V. 62, 1965: $5811^{c,d}$

FUKUCHI, M.; HISHIKI, N.; et al.
High molecular weight constituents in soy sauce. I. Isolation of peptides, glycoproteins, and polysaccharides from soy sauce. (Fac. Eng., Osaka Univ., Suita, Japan). Hakko Kogaku Zasshi 1969, 47(8), 510-17 (Japan).

Isolations of peptides and anthrone-pos. substances including glycoprotein, polysaccharide, and monosaccharide from soy sauce are described. A soy sauce made from soybeans and wheat was used as a sample. Small mol. substances were removed from the sample by dialysis. The remaining portion was placed on Dowex 50 X - 1 (H form) to remove colored substances and small mol. wt. peptides. The effluent was further fractionated by chromatog. on Dowex 50 X -2 (Na form) column. By an elution with a citrate buffer at pH 2.2, 1 glycoprotein, 2 polysaccharide, and 3 monosaccharide fractions were obtained. By elutions with the buffer at pH over 3.1, at least 26 types of high peptide fractions were obtained. One of the polysaccharides, Fraction C-2 obtained by rechromatog. on Dowex 50 X - 2 column, appeared homogeneous on electrophoresis.

A glycoprotein fraction was further isolated to 8 fractions by successive gel filtration on DEAE-Sephadex A-50, Sephadex G-75, and Sephadex G-100. Among them, 5 glycoprotein fractions were found homogeneous by electrophoresis. Monosaccharides were identified as xylose, arabinose, glucose, galactose, and fructose on paper chromatograms and paper electrophoregrams. The total glycoprotein content was about 0.52 g/100 ml of soy sauce as xylose. The total polysaccharide content was only about 0.03 g/100 ml.
CA, V. 73, 1970: 75845v

FUKUSHIMA, D.; YOKOTSUKA, T.
Components of soy sauce. I. Nitrogenous components. (Kikkoman Shoyu Co., Ltd., Noda, Japan). Nippon Jozo Kyokai Zasshi 1967, 62(7), 724-8 (Japan).

Proteins, peptides, amino acids, and other N-contg. substances in Japanese soy sauce, and its raw materials are reviewed together with their changes during the manuf. of soy sauce. 55 references.
CA, V. 68, 1968: 67763y

FUKUSHIMA, D.; YOKOTSUKA, T.
Components of soy sauce. II. Carbohydrates and degradation products of lipids. (Kikkoman Shoyu Co. Ltd., Noda, Japan). Nippon Jozo Kyokai Zasshi 1967, 62(8), 861-4 (Japan).

Sugar components of soybeans, wheat, and soy sauce are described, together with glycerol and other polyols in soy sauce. 44 references.
CA, V. 68, 1968: 67764z

FURUYA, K.
Variations in components of shoyu (soy sauce) mash juice filtered under various pressures. (Izumiiti Co., Kaizuka, Japan). Chomi Kagaku 1968, 15(6), 14-6 (Japan).

Concd. soy sauce mash should be filtered ubder high pressure. Application of high pressure produced mash juice with lower d., total N, EtOH, and sugars. The product obtained by use of high pressure was inferior. This was also true in organoleptic tests.
CA, V. 73, 1970: 43986a

GOTO, S.
Constituents and composition of aroma concentrates from soy sauce. I. Neutral fraction. (Ochanomizu Univ., Tokyo, Japan). Eiyo To Shokuryo 1973, 26(2), 135-8 (Japan).

Soy sauce was evapd. at 35-40° under 15-20 mm Hg for 5 hr and the vapor was trapped by means of cooling at 0° and at below the freezing point using acetone-dry ice as coolant. A neutral fraction of the distillate trapped at 0° had the specific aroma of soy sauce. This fraction contained ≥ 33 components. Among them, butyl formate, 2-ethoxyethanol, trans-2-hexen-1-ol, 1-octen-3-ol, furylmethylketone, and pyrrylmethylketone were identified using gas-liq. chromatog., ir, and gas chromatog.-mass spectrometry. A mixt. of these known compds. had a somewhat characteristic aroma of soy sauce.
CA, V. 79, 1973: 114134h

HAMADA, S.; GAMO, K.; et al.

Sugars in soy sauce. (Tohoku Univ., Sendai). J. Fermentation Technol. (Japan) 1956, 34, 407-10

Soy sauce (2 l.) was concd. to 1 l. under reduced pressure at 25°, pptd. NaCl filtered off, 1 l. MeOH added, the mixt. left overnight, NaCl filtered off, the mixt. concd. under reduced pressure, the residual soln. treated with Amberlite IR-120 and IR-410, protein removed with basic Pb acetate, and the filtrate concd. to approx. 500 ml. Partition paper chromatography and paper ionophoresis of this sugar soln. indicated the presence of xylose, arabinose, glucose, and galactose distinctly, and spots corresponding to glycerol, mannitol, and an oligosaccharide-like substance were detected. Stachyose, raffinose, sucrose, and fructose present in the starting materials, soybean and wheat, of soy sauce seemed to disappear during the brewing. After column chromatography of the sugar soln. with C-celite, mannitol was obtained in cryst. form. Detns. of the above sugars were performed by the Nelson and anthrone methods after multiple paper chromatography of the sugar soln., and elution of the sugars on the chromatogram with water for 5 hrs. The contents found were (by Nelson and anthrone methods, resp.): xylose 0.082, 0.086; arabinose 0.166, 0.159; glucose 1.004, 0.989; galactose 0.482, 0.478 g./100 ml. of original soy sauce.

CA, V. 51, 1957: 3918i

HASHIBA, H.

Melanoidin from soy sauce. (Noda Inst. Sci. Res., Noda, Japan). Nippon Nogei Kagaku Kaishi 1973, 47(11), 727-32 (Japan).

Melanoidins were prepd. from soy sauce, from mixt. A contg. glucose, xylose, glycine, glutamic acid, and NaCl, and from mixt. B contg. similar amino acids to soy sauce, by chromatog. on DEAE-cellulose, gel filtration through Sephadex G 100, and freeze-drying, and the isolated compds. contained no protein, amino acid, or reducing sugar. Some properties of the melanoidins from soy sauce and the two mixts. are given.

CA, V. 80, 1974: 144494p

HORI, S.; MOTOSAKI, S.; et al.

Decolorization of amino acid soy sauce and simultaneous separation of aromatic amino acids. (to Ajinomoto Co.). Japan. 3789('58), May 16.

A HCl hydrolyzate of protein is treated for sepn. of glutamic acid. The mother liquor (1000 ml.) is treated by passing it through 300 g. of a non-ion-exchanging decolorizing resin at a rate of 10 ml./min. to obtain 85%-decolored soy sauce. The resin is washed with 300 g. H_2O and the effluent concd. to 30 ml. to sep. 0.7 g. tyrosine. Further concn. of the mother liquor gave 2.7 g. phenylalanine-HCl.

CA, V. 53, 1959: P 5586g

HORI, S.; OGAWA, T.; et al.
The behavior of L-glutamic acid in soy sauce (shoyu). I. Various types of L-glutamic acid and their formation mechanism in soy sauce. (Ajinomoto Co., Kawasaki). J. Agr. Chem. Soc. Japan 1956, 30, 519-23.

Analyses were made on several samples of com. soy sauce and brewed soy sauce of various types of L-glutamic acid (I), i. e. free I, L-pyroglutamic acid (II), I in peptide form, and L-glutadine (III). The total I in soy sauce consisted mainly (more than 90%) of the mixt. of free I and II and only 4-5% of I in peptide form. In the course of brewing soy sauce a large amt. of III was formed at first, its amt. being nearly the same with that of free I. Most of II was formed nonenzymically from III in the course of brewing, but a part of II was formed from free I. The I in soy sauce continued to change into II during storage. Formerly I was considered to be formed from I-contg. peptide derived from the protein, but it was proved that other pathways existed, i. e. a large amt. of III was formed the peptide and II was formed from III directly or indirectly through free I. In soy sauce asparagine was detected tohether with aspartic acid.
CA, V. 51, 1957: 5357a

FEIGENBAUM, I.J.
Soybean food for today and tomorrow. Gordian 1973, 73(1680), 390-1; (1681), 428-30; (1682), 464-5. E 1166.

This is a short review of present knowledge regarding the utilization of soya beans, which have become one of the most important raw materials in the food industry. With soya beans as a source, both an excellent edible oil and important cheap food products are now prepared. A few exotic products prepared from soya beans are described. Because of the favourable nutritive or biological value and the low cost of soya beans, and the use of modern processing techniques, new types of nutritious foods, adjusted to the flavour and taste of the Western countries may be produced. German summary. Tables. Graphs. 21 refs.
Royal Tropical Institute, Amsterdam, x1363.

IMAI, S.; SUZUKI, K.; et al.
Components of shoyu (soy sauce) mash with different temperatures in the early stages of brewing.(Prefect. Food Res. Inst., Niigata, Japan). Chomi Kagaku 1969, 16(5), 1-5 (Japan).

Soy sauce was brewed for 150 days from defatted soybean flakes, wheat, and 22.9% NaCl. Most of the brewing was carried out at 28°, and for the initial 30 days at 10, 15, 20, or 25°. NaCl, pH, total N, formol N, peptide N, nonpeptide N, free glutamic acid, reducing sugar, EtOH, lactic acid, and dissolved N were detd. Dissolved N and glutamic acid were higher in the mashes kept at 10 or 15° in the early stage, owing to slower inactivation of acid protease. Org. acids in the mashes included propionic, levulinic, acetic, pyruvic, fumaric, formic, α-ketoglutaric, succinic, lactic, pyroglutamic, glycolic, malic, and citric acids. They changed considerably temporarily, but levels were similar in the final stages,

except that pyroglutamic and pyruvic acids were higher in the mashes kept at 25° in the early stage.
CA, V. 73, 1970: 43984y

INOUE, T.
White soy sauce. I. Free amino acids and nonvolatile fatty acids in white soy sauce. J. Soc. Brewing 1956, 51, 252-4 (Japan).

White soy sauce (I) is made from soybean and wheat (2:8 or 3:7), the raw material of I is much richer in starchy materials than that of usual soy sauce, and the color of I is very light. Analyses were made for free amino acids and nonvolatile fatty acids by paper chromatography. Cystine, aspartic and glutamic acids, serine, glycine, threonine, alanine, tyrosine, valine, proline, leucine, phenylalanine, lysine, histidine, and arganine, were detected as free amino acids. Glutamic acid, alanine, valine, and arginine were in comparatively large amt. About 70% of nonvolatile fatty acids were in salt state, and lactic, malic, citric, tartaric, and oxalic acids were detected as acid constituents. Basic amino acids, such as lysine and arginine, seemed to give good taste in combination with glutamic and succinic acids.

II. Volatile acids. Ibid. 399-400.

Volatile org. acids in I were sepd. as hydroxamates by paper chromatography. Formic, acetic, propionic, and butyric acids and an unknown spot were detected. The unknown spot showed R_f value of 0.25 by H_2O-satd. BuOH as solvent, where R_f of formic acid was 0.43. AcOH was in the largest amt. and formic, butyric, unknown, and propionic acids followed in this order.
CA, V. 50, 1956: 15987i

ISHIGAKI, R.; NAGASE, I.
Semichemical soy sauce. III. Quantitative transition of amino acids in the semichemical processing of soy sauce. (Tokyo Univ. Agr.). Nippon Jozo Kyokai Zasshi 1964, 59(2), 161-2 (Japan); cf. CA 61, 6278g.

Variations in the amts. of amino acids in the mash were examd. during semichem. processing of soy sauce at 15-day intervals by using an amino acid analyzer and enzymic methods. Alanine increased proportionately to the maturity of the mash. Tryptophan was present in trace amts. in both the acid hydrolyzate of soybeans and the matured mash. Cystine was also found in trace amts. during the whole process. All of the other amino acids showed a max. value at some point during the 60-day period of the process.

IV. Quantitative transition of organic acids in the semichemical processing of soy sauce. Ibid. (3), 270-2.

Variations in the amts. of org. acids in the semichem. processing of soy sauce were studied with gas chromatography. Among 30 peaks found in the chromatogram, the following 16 acids were identified:

formic, acetic, propionic, isobutyric, butiric, glycolic, lactic, oxalic, malonic, levulinic, succinic, maleic, glutaric, malic, pyrrolidone carboxylic, and citric acids. Formic, oxalic, levulinic, and citric acids decreased in proportion the the maturity of the mash, while lactic and succinicacids increased. Propionic, isobutyric, and butyric acids could not be detd. because of their presence in trace amts. Each of the other acids showed a max. content at some point during the 60-day process.
CA, V. 63, 1965: 8963a

ISHIGAKI, R.; NAGASE, I.
Semichemical soy sauce. V. Quantitative transition of alcohols in the semichemical soy sauce processings. (Tokyo Univ. Agr.). Nippon Jozo Kyokai Zasshi 1964, 59(60), 507-9 (Japan); cf. CA 63, 8963a.

Variations in the amts. of alcs., e.g. EtOH, PrOH, BuOH, iso-BuOH, amyl and iso-amyl alcs., were followed during the semichem. processing of soy sauce with gas chromatography at 10-day intervals. EtOH increased in proportion to the maturity of the mash. On the other hand, all of other alcs. showed no substantial variations during 60 days. Amyl alc. was found for the first time in the soy mash.

VI. Quantitative transition of sugars in the semichemical soy sauce processings. Ibid. 60(4), 359-62(1965).

Variations in reducing sugar were examd. during the process. Soybean acid hydrolyzate as raw material contained total reducing sugar 2.07, galactose (I) 1.06, glucose (II) 1.12, fructose (III) plus mannose (IV) 0.10, arabinose (V) 0.21, xylose (VI) 0.07, and rhammose (VII) 0.02%. Total reducing sugars in the mash was 5.00% at mashing, increased to the max. of 5.72% after 15 days, and then decreased. II and I were the major components of the mash, the content at mashing being, resp., 2.51, and 1.36%. II, III, and IV decreased at later stages of maturing process, while other sugars did not show much variation in their contents. The mash at completion contained total reducing sugars 4.05, I 1.11, II 1.97, III + IV 0.16, V 0.21, VI 0.19, and VII 0.04%. The amt. of fermentable sugars in the mash was enough to support fermentation during the process.
CA, V. 63, 1965: 12945a

JAN, C.C.; HOSOKAI, Y.; et al.
Components of Taiwan soy sauce. I. (Nihon Univ., Tokyo, Japan). Nippon Daigaku Nojuigakubu Gakujutsu Kenkyu Hokoku 1970, (27), 32-43 (Japan).

The chem. compn. of Taiwan soy sauce (pH 4.90) with sp. gr. of 1.13 was NaCl 12.9, total N 0.60, amino N 0.28, and total sugars 0.15%. By thinlayer chromatog., 15 free amino acids including α-aminobutyric acid, and glucose, fructose, and sucrose were detected. Sucrose may have been added as a sweetener. From the ether-hexane ext., MeOH, EtOH, PrOH, iso-PrOH, BuOH, amyl, and isoamyl alcs., and Et formate, acetate, malonate, maleate, succi-

nate, and lactate, and Bu and isoamyl acetates, and AcOH, butyric and propionic acids, furfural, PhCHO, and diacetyl were detected by gas chromatog. When raw Taiwan soy sauce was heated at 102° for 180 min, amino N and total sugars were considerably decreased, and the absorbance at 290, 470, and 530 m was increased. Browning by the Maillard reaction took place.
CA, V. 73, 1970: 44073n

KAJIMOTO, Y.; SHIMOHISA, M.; et al.
Histamine contents of shoyu (soy sauce). (Tokishima Univ.). Igaku to Seibutsugaku 1955, 35, 206-9.

Histamine (I) was extd. from shoyu by the method of Yokoyama (cf. Tokyo Med. News, 60, 4(1936) and detd. by a modified Sera's diazo reaction (cf. Sera, et al., J. Osaka Med. Assoc. 38, 1017(1939). Lambert-Beer's law held when photometric readings were taken 2 min. after color development. This modified procedure gave more reproducible results than when photometric readings were taken at max. color intensity 20-30 min. after color development. The I contents in 5 specimens of shoyu were 16, 9.5, 6.5, 6.0, 1.6, and 1.3 γ/cc., resp.
CA, V. 52, 1958: 2298a

KAKEGAWA, K.; YOSHIOKA, T.; et al.
New commercial mixed sweetener, Marumilon. (Maruzen Kasei Co., Onomichi, Japan). Chomi Kagaku 1968, 15(2), 6-9 (Japan).

Since dulcin might be prohibited for use in soy sauce, a new com. sweetener, Marumilon, was devised. This consists of Na cyclamate 79.5, saccharin Na 10.8, Na citrate 6.5, and glycyrrhizin 3.2%. This has an ideal sweet taste for soy sauce. It is 100 times as sweet as sucrose.
CA, V. 73, 1970: 43983x

KAMADA, H.; EBINE, H.; et al.
Browning reaction of soybean products. XIV. Browning of soaked soybean during autoclaving. 3. (Food Res. Inst. Tokyo). Nippon Shokuhin Kogyo Gakkaishi 1963, 10(2), 47-52 (Japan); cf. CA 59, 12091g.

The effects of heating and steaming were examd. on the solubilities of soybean pentosan and N compds. Raw soybeans contained about 10% H_2O-sol. pentosan. The H_2O-sol. pentosan increased by steaming to 15-20%. Generally, new soybeans contained larger amts. of H_2O-Sol. pentosans. Pentosans sol. in 0.2% NaOH were 20-30%. The soly. of these pentosans varied with the variety but also was influenced by the period of storage. H_2O-sol. N compds. were markedly decreased by steaming from 80% to 10%. Soybeans contained about 5 mg. % of 2,6-dichloroindophenol-reducing substances and this amt. was not affected by steaming.

XV. Browning of soaked soybean by autoclaving. 4. Ibid. 53-6.

The surface color of steamed defatted soybean varied considerably according to variety. No marked difference was observed in the surface color between raw and defatted soybeans. Pentosan showed no marked difference but N compds. showed considerable differences in the defatted soybeans with different varieties.

XVI. Coloration of bottled soy sauce during storage. Ibid. 99-101

Effects of O and temp. were tested on the color of bottled soy sauce. O had no marked effect on the color. Temp. was proved to be a main factor for the development of color. Above 30°, color formation occurred in the absence of O.
CA, V. 63, 1965: 1156h

KANBE, C.; OZAWA, Y.; et al.
Automated measurement of ethanol in soy sauce. (Kikkoman Shoyu Co., Noda, Japan). Chomi Kagaku 1974, 21(6), 27-9 (Japan).

EtOH [64-17-5] in soy sauce was detd by using alc. dehydrogenase; H liberated from EtOH by the action of the enzyme was used to form NADH, which gave rise to an increase in absorbance at 34 mμ. The absorbance was calcd. for EtOH concn. by a std. curve. The procedure was done with an automatic analyzer; 40 samples can be detd. There was a highly significant correlation between the usual titrn. method and this enzymic method. The std. error was 2% and the recovery of EtOH from soy sauce was 98%.
CA, V. 84, 1976: 29291r

KANEKO, T.
Isolation of histamine and methionine from shoyu. J. Chem. Soc. Japan 1939, 60, 539-41.

Pure histamine was sepd. from shoyu, soybean sauce, as follows: 6 l. of Kikkoman brand was distd. at low temp. under low pressure. After distn. was complete, the remainder was mixed with warm MeOH and the ppt. (NaCl, 1250 g.) was filtered out. The residue, after the MeOH was driven off under low pressure, was dissolved in water to form a neutral soln., to which a satd. soln. of $HgCl_2$ or $Hg(OAc)_2$ was added. The ppt. formed was stirred in warm water and treated with H_2S. The mixt. was distd. under low pressure and the residue, after extg. with MeOH, yielded crystals which, when dissolved in water, acidified with dil. HCl and treated with 50% $H_2PO_4.12WO_3$, formed a ppt. This was washed with 2.5% $H_2PO_4.12WO_3$ contg. 1% HCl, filtered, and treated with BaO. The product was freed of Ba by means of H_2CO_3, acidified with AcOH, and, after adding warm flavianic acid, was left for several days in a cool place, stirring occasionally, to yield crystals of histamine flavianate. The flavianate was treated with concd. HCl, decolorized with active C, and distd. under low pressure. The residue was treated with abs. alc. and concd. HCl twice, and a viscous substance was sepd. The remainder was dissolved in water, decolorized, dried over a steam bath, washed with alc. and HCl, and allowed to crystallize into white rods of pure histamine-HCl (yield, 0.4 g.), m. 240-3°. When 0.1 g. of the HCl salt was dissolved in water and a satd. aq. soln. of 0.5 g. picric acid was added to it, yellow flakes of pure histamine picrate, m. 234-5°, were obtained when recrystd. from water. Methionine, which is responsible for the aroma of shoyu, could not be obtained in the above process, and therefore, was sepd. as follows: 2 l. of the

same shoyu was distd. on a 40-50° water bath under low pressure. Then 3 l. abs. alc. was added to the remainder after filtering out the NaCl, and the mixt. was satd. with dry HCl gas, left in a cool place, the NaCl again filtered off and the alc. distd. The residue, after adding 2 l. abs. alc., was satd. with dry HCl gas and boiled for 10 hrs. The solvents were then distd. off at low temp. and pressure. The esterification was repeated once more. A small amt. of the residue was dissolved in acid water, and, after cooling, ether was added and the soln. mixed with 50% K_2CO_3. The mixt. was extd. with ether, dried over anhyd. K_2CO_3 and fractionated under low pressure after the ether was eliminated. Five fractions, distd. at 65-125°/1-1.5 mm., contained leucine, alanine, proline, phenylalanine and S compds. The S compds. (distd. off at 75° and above) were dissolved in a small amt. of water and mixed with a satd. soln. of $HgCl_2$ to form a ppt. which was filtered in hot water and treated with H_2S. The filtrate, after distg. under low pressure and drying, yielded crude methionine-HCl, from which methionine was sepd. by dissolving in a small amt. of water and adding a drop of concd. NH_4OH and alc. The methionine crystals were dissolved in water, decolorized with active C, concd. under low pressure over H_2SO_4, and allowed to recrystallize after adding a small amt. of abs. alc. The ppt. which appeared first was filtered out and the rest was recrystd. twice from water and alc. to yield 30 mg. of slightly bitter, shining white flakes of pure methionine, decomp. 275-6°, $[\alpha]_D^{20} - 5.7°$
CA, V. 36, 1942: 2857^8

KATO, H.
Cause of deterioration of soy sauce. (Univ. Tokyo, Tokyo, Japan). Chomi Kagaku 1969, 16(3), 27-39 (Japan). An address.

Topics include the classification of browning reactions, carbonyls responsible for browning, decompn. of reducing sugars, course of amino-carbonyl reaction, properties of melanoidins, 3-deoxyosones, colors of soy sauce in various stages of brewing, and changes of soy sauce by heating, sugars, and air.
CA, V. 73, 1970: 43942h

KATO, H.; YAMADA, Y.; et al.
Mechanism of browning of soybean products. I. Separation and identification of 3-deoxyglucosone from soy sauce and miso. (Univ. Tokyo). Nippon Nogei Kagaku Kaishi 1961, 35(5), 412-5 (Japan).

3-Deoxyglucosone (I) was isolated and identified as its bis-2,4-dinitrophenylhydrazone, $C_{18}H_{18}N_8O_{11}$ (ir spectrum given). The I content calcd. from the isolated crystals of its bis-2,4-dinitrophenylhydrazone was a follows: darker soy sauce (shoyu) 3-8, lighter soy sauce 3, tamari soy sauce 17, naturally fermented soy sauce before pasteurization 13, chem. soy sauce (protein hydrolyzate with HCl) 0, Sendai miso 41, Shinshu miso 11, and white miso 10 mg. %. During the fermentation of soy sauce, I was not detected from soybean koji, I appeared in soy sauce mash within a few days after blending soybean koji with salt water, and increased during fermentation.
CA, V. 62, 1965: 9699h

KAWAKAMI, Y.

Improvement of the flavor of soy sauce. (to Keikichi Endo). Japan. 4444('55), June 28.

Et esters (100 parts) of fatty acids consisting mainly of linoleic and oleic acids are dissolved in 50-100 parts of EtOH by employing 50-150 parts of poly(oxyethylene sorbitan monooleate or -palmitate) as an emulsifier. Then 0.1-3 parts of the soln. is added to 100 parts of a soy sauce of inferior flavor. The Et ester of cottonseed oil is also effective.
CA, V. 51, 1957: P 13311e

KAZAMA, Y.

Determination of reducing sugar in soy sauce. II. Influence of amino acids on the determination of reducing sugar by a modified method of Seiler. (Ibaraki Prefect. Inst. Brewing, Mito). Nippon Jozo Kyokai Zasshi 1956, 51, 800-3; cf. C.A. 51, 12425g.

The method of Seiler (C.A. 32, 2163^8) by employing the reagent of Lane-Eynon (C.A. 17, 1400) was more accurate than either alone. NaCl, alanine, aspartic acid, glutamic acid, and mieki, an amino acids mixt. obtained from mono-Na glutamate manuf. as a by-product, exerted some inhibiting effects on the detn., but other amino acids showed no appreciable effect.
CA, V. 52, 1958: 13184d

KIHARA, K.

The aroma of soy sauce. I. The volatile ingredients. J. Soc. Chem. Ind., Japan 43, Suppl. binding 403(1940) (in German); cf. C.A. 33, 2106^3.

Soy, a common condiment, contains approx. 0.14-0.32% EtOH (air-current method). One hundred l. of soy sauce, obtained from soy-sauce paste 12 months old, was extd. with Et_2O; 400 cc. of the ext. yielded upon fractional distn. 285 cc. of volatile constituents distg. below 130, 70 cc. of difficulty volatile constituents I and 30 cc. of difficulty volatile constituents II. The volatile portion contained AcOH, EtOH and EtOAc. The distillate was neutralized with Na_2CO_3 and extd. with Et_2O, after which the ext. was fractionally distd. into 5 fractions b. from 36° to 83°, all fractions giving the natural fusel-oil reaction; the residue from the distn. gave the furfural reaction.

II. Difficulty volatile constituents. Ibid. 403.

This material was divided by chem. treatment into 3 groups: (1) phenolic substances, from which were isolated maltol (which was the main odoriferous portion of the Et_2O ext., and which was called "syoyuol") and "syoyuferin", (2) neutral substances, from which was isolated isoamyl lactate and (3) acid substances, which contained lactic acid and lactide.

III. The similarity between soy sauce and the products obtained by hydrolysis of soybeans with hydrochloric acid. Ibid. 403.

Oxidation of the phenolic constituents of soy sauce and of the

hydrolysis products from soybeans by means of $KMnO_4$ yielded oxalic acid.
CA, V. 35, 1941: 4911^{3,4,5}

KIKUCHI, T.
Neutral polysaccharides in soy sauce. (Cent. Res. Lab., Kikkoman Shoyu Co., Ltd., Tokyo, Japan). Nippon Nogei Kagaku Kaishi 1975, 49(11), 597-601 (Japan).

Two neutral polysaccharides, a glucan [9012-72-0] and a galactomannan [11078-30-1], were isolated and purified from soy sauce. By methylation anal., Smith degrdn. and some other chem. methods, the glucan was confirmed to be a typical dextran constituted of α-1,6-linked D-glucose residue as the main chain. The side chain seemed to be composed mainly of α-1,3-linkage.
CA, V. 84, 1976: 103995s

KOMOTO, Y.
Suspended black matter formed in soy sauce. (Hiroshima Prefect. Inst. Food Eng., Hiroshima, Japan). Hiroshima-Ken Shokuhin Kogyo Shikenjo Kenkyu Hokoku 1970, (11), 20-6 (Japan).

A suspended viscous black matter is occasionally formed in soy sauce in pasteurization or in bubbling. The formation of the matter was obsd. by bubbling of various combinations of soy sauce, H_2O, or 18.5% NaCl soln. and additives such as $HOC_6H_4CO_2Bu$ (I), ext. from the root of licorice (Glycyrrhiza glabra) (II), caramel, dulcin, B_2OH, AcOH, $CaCO_3$, BzONa, K sorbate, EtOAc, and EtOH. Soy sauce without the additives did not form the black matter at pH 3.8-8.5 upon bubbling. Bubbling with air, O_2, N_2, or CO_2 resulted in the formation of black matter in 18.5% NaCl soln. contg. I and II. Com. soy sauce at least contg. I and II, and H_2O and 18.5% NaCl soln. with addn. of I and II resulted in the formation of black matter by bubbling. Heating had no influence on black matter formation. The formation of black matter is caused by bubbling in the presence of I and II.
CA, V. 76, 1972: 125494 q

KONDO, Y.; AOKI, R.; et al.
Types of dicarboxylic amino acid residues in the vegetable proteins from the raw material for soy sauce. (Ajinomoto Co., Ltd., Kawasaki). Nippon Nogei Kagaku Kaishi 1958, 32, 518-21.

Defatted soybean cake was extd. thoroughly with H_2O, 10% NaCl, and EtOH (d. 0.836), consecutively, and the residue extd. with 2% NaOH; the ext. was acidified to pH 4.6 to ppt. soybean glutelin (I). I and wheat gluten (II) were the chief raw materials for exptl. soy-sauce manuf. The types of -COOH groups of dicarboxylic amino acid residues of I and II were studied by means of the hydrazinolysis-dinitrophenyl method of Akabori, et al. (CA 50, 15692i). Most of these residues were of the amide and (or) branched type, the ratio of amide plus branched type to total glutamic residue was 73 and 94, and to aspartic residue 78 and 74% for I and II, resp. This shows that pyroglutamic acid, prevalent in soy sauce, is derived from glutamic acid of I and II.
CA, V. 54, 1960: 20002h

KUROSHIMA, E.; YONESAKI, H.
Determination of glutamic acid in soy sauce. (Marukin Shoyu Co., Shodo-shima). Hakko Kogaku Zasshi (J. Fermentation Technol.) 1952, 30, 332-6.

The Olcott method (C.A. 38, 3685^1) is applicable for detn. of glutamic acid (I) in soy sauce since it contains small amts. of cysteine and cystine (av. 12.5 mg./100 cc.). The influence of glucose present is slight. The evolution of Amino N in pure soln. of I was 92.08 ± 0.34% and the recovery of I in soy sauce was 99.7-102.5%. The concns. of I before and after hydrolysis of various kinds of soy sauce were 0.752 ± 0.347 and 1.198 ± 0.386%, resp.
CA, V. 47, 1953:7921

LOHSE, H.W.
The soybean as a food product and industrial raw material. Can. Chem. Met. 1936, 20, 224-5.

A general discussion of the products of the soybean, their food value and chem. compn.
CA, V. 30, 1936: 6505^9

MATSUI, H.; OKADA, Y.; et al.
The lactic acid content in shoyu (Univ. Hiroshima). Hiroshima Daigaku Kogakubu Kenkyu Hokoku 1960, 9, 53-5; cf. preceding abstr.

Lactic acid (I), one of the main acid constituents of shoyu (soybean sauce), was detd. in 20 samples according to the method reported previously(loc. cit.). I content was in the range of 700-1600 mg. %.
CA, V. 55, 1961: 16905b

MOGI, K.; OSHIMA, Y.; et al.
Soy sauce production using a submerged culture. VIII. Factors in the increase of free glutamic acid. (Noda Shoyu Co., Chiba, Japan). Hakko Kogaku Zasshi 1962, 40, 532-8; cf. Mogi et al., ibid. 39, 665(1961); CA 52, 16647c.

In a newly reported submerged process of soy sauce manuf., the increase in free glutamic acid was attributed to the autolysis of the koji mold which accumulated glutamic acid in its mycelia during growth.
CA, V. 62, 1965: 16884^f

MOON, B.S.; KIM., B.S.; et al.
Studies on quality of soybean sauce on marketing. Rep. Nation. Inst. Health R.O.K. 1969, 6, 259-65. Tab. 10 Ref. 11

Fungicides in soybean sauces collected from 55 manufacturers in Korea have been studied. It was founded that p-oxybenzoic acid butyl ester was used in 53 samples, and mixture of p-oxybenzoic acid ester and benzoic acid in 2 samples. All of fungicides found in samples are officially allowed materials. On the other hand the effect of condensates of phosphates e.g. $(NaPO_3)_x$

on the antiseptic action of various fungicides in soybean sauces has been studied. Each fungicide mixed with condensate of phosphate, $(NaPO_3)_x$ at the experiment, was added to every plot of soybean sauce, otherwise to different fungicides were mixed with condensate of phosphates, $(NaPO_3)_x$, and added to the another plot of sauce all together. It was found that the addition of condensate of phosphates e.g. $(NaPO_3)_x$ increased the fungicidal action, against harmful pellicle forming yeasts, the mixture of p-oxybenzoic acid butyl ester and vitamin K_3, and the mixture of vitamin K_3 and sorbic acid.
Korean Sci. Abstr., V. 2, 1970: 629

MORIGUCHI, S.; ISHIGAMI, Y.
Components of soy sauce. III. Organic acids. (Higashimaru Shoyu Co. Ltd., Tatsuno, Japan). Nippon Jozo Kyokai Zasshi 1967, 62 (9), 995-1000 (Japan).

The kinds, contents, and variations in org. acids during soy sauce manufg. processes are summarized. 56 references.
CA, V. 68, 1968: 67765a

MORIGUCHI, S.; ISHIKAWA, H.; et al.
Organic acids in soysauce. III. Composition of organic acids in wheat and wheat bran. (Tatsuno Shoyu Co., Hyogo, Japan). Hakko Kogaku Zasshi 1961, 39, 293-7; cf. CA 54, 6023i.

Wheat contained malic (I) 36-56, citric (II) 9-25, glycolic (III) 0.8-11.6, acetic (IV) 3.1-17.2, fumaric (V) 3.8-24.7, succinic (VI) 3.8-17.4, propionic (VII) 0.2-1.3, α-ketoglutaric (VIII) 0.6-1.5, and pyroglutamic (IX) acids 5.6-17.4 mg.%. A few unidentified acids were also found. Total and individual acid contents differed depending on the variety of wheat. Wheat bran contained more total and individual acids than wheat, esp. III and II. IV.
CA, V. 59, 1963: 5688f

MORIMOTO, S.; MATSUTANI, N.
Flavor components of soy sauce. Isolation of furfuryl alcohol and the formation of furfuryl alcohol from furfural by yeasts and molds. (Shoin Junior Coll., Kobe, Japan). Hakko Kogaku Zasshi 1969, 47(8), 518-25 (Japan).

Isolation of the flavor components in a raw soy sauce and a com. soy sauce were carried out with gas-liq. chromatog. The flavor components were extd. with ether from these soy sauce samples. Some of the ether extract solns. were neutralized with a NaOH soln. but others were not. Then they were all concd. at 40° and then the flavor components were isolated by gas-liq. chromatog. Furfuryl alc. production from furfural by 22 strains of yeasts and molds was detd. Furfuryl alc. was produced by all 22 strains of yeasts and molds using koji ext. media contg. 0.1% furfural. The yield of furfuryl alc. from furfural was 29.4-103.5% (vol./vol.). Several microorganisms found in a soy sauce mash also produced furfuryl alc.
CA, V. 73, 1970: 75846w

MOTAI, H.; INOUE, S.; et al.
Color of soy sauce. I. Characteristics of soy sauce color and separation of color components. (Kikkoman Shoyu Co., Ltd., Noda, Japan). Nippon Nogei Kagaku Kaishi 1972, 46(12), 631-7 (Japan).

Color materials of soy sauce were fractionated into 8 peaks by DEAE-cellulose column chromatog. with stepwise elution by elevating NaCl concn. The color tone of each peak darkened according to the order of eluation. Bright tone components increased after heating of soy sauce and dark tone components increased after oxidn. of soy sauce. Dark tone components increased and color tone was unchanged when melanoidin obtained from the model system of glycine-xylose was oxidized.
CA, V. 78, 1973: 122805x

MOTAI, H.; INOUE, S.
Color of soy. II. Oxidative browning of soy. (Res. Lab., Kikkoman Shoyu Co., Ltd., Takasago, Japan). Nippon Nogei Kagaku Kaishi 1974, 48(6), 329-36 (Japan).

The pigments of soy sauce were sepd. into 8 fractions by DEAE-cellulose chromatography, and their est. mol. wts. ranged from 600 to 4270. Each fraction was pos. to Bial reagent and to anthrone and ninhydrin, had no taste or odor, and gave uv and ir spectra characteristic of melanoidins. Upon oxidn. each fraction was converted to the next fraction of higher mol. wt. The color of soy sauce is probably due to oxidizable melanoidin produced by the amino-carbonyl reaction between pentose and dipeptides or tripeptides.
CA, V. 82, 1975: 15475a

NAKATANI, K.; MATSUMOTO, F.; et al.
Effects of soysauce (Shoyu) on the texture of foods during the process of cooking. II. Sakurai, Yoshito (Ochanomizu Joshi Daigaku, Tokyo, Japan). Kaseigaku Zasshi 1974, 25(3), 201-6 (Japan).

Various org. acids and ions present in soy sauce were examd. for the cause of hardening of soybeans cooked in the sauce. All the 16 acids, including glutamic and aspartic acids, and Ca^{++}, Mg^{++}, and Fe^{3+} gave hard textured beans, whereas Na^+ and K^+ gave soft beans when compared with those cooked in H_2O alone. The addn. of AcOH, lactic and succinic acids to a 0.4M buffered soln. contg. 5 g NaCl/dl gave soft textured beans compared with those cooked in 0.1M org. acid contg. 5g NaCl/dl or in soy sauce alone.
CA, V. 81, 1974: 103435x

NAKATANI, K.; MATSUMOTO, F.; et al.
Effects of soy sauce on the texture of foods during cooking. I. (Ochanomizu Univ., Tokyo, Japan). Chomi Kagaku 1974, 21(10), 34-9 (Japan).

Soybean, radish, and potato were cooked in 0.5-18% NaCl /7647-14-5/ solns. and in soy sauce solns. contg. 0.5-18% NaCl. By measurement with a curdmeter and sensory tests, the foods

cooked in the soy sauce solns. were significantly harder than those cooked in the NaCl solns. Soybean was cooked in H_2O or H_2O with addn. of NaCl, a mixt. of amino acids, and a mixt. of org. acid which corresponded to the compn. of amino acids and org. acids in soy sauce. The hardness of cooked soybean due to the solns. was in the following order; amino acids + org. acids > org. acids > amino acids > NaCl + amino acids + org. acids > H_2O > NaCl + org. acids > soy sauce soln. > NaCl + amino acids > NaCl soln.
CA, V. 83, 1975: 176929n

NAKATANI, K.; MATSUMOTO, F.; et al.
Effects of soy sauce on the texture of foods during cooking. II. (Ochanomizu Univ., Tokyo, Japan). Chomi Kagaku 1974, 21(10), 40-5 (Japan).

Soybean was cooked in H_2O or H_2O with addn. of 1 of 5 inorg. salts (0.01-0.2M), 12 amino acids (0.01-0.1 M), and 14 org. acids (0.01-0.5 M) which were contained in soy sauce. Soybean cooked with glutamic [56-86-0] or aspartic acids [56-84-8], or 1 of the org. acids was harder than that cooked in H_2O. Soybean cooked in H_2O contg. NaCl [7647-14-5] or KCl [7447-40-7] was softer and in H_2O contg. $CaCl_2$ [10043-52-4], $MgCl_2$ [7786-30-3], or $FeCl_3$ [7705-08-0] was harder than that cooked in H_2O. Soybean cooked in soy sauce soln. contg. 5% NaCl with addn. of glutamic or aspartic acid, or 1 of the org. acids was 1.5-2 times as hard as that cooked in soy sauce soln. contg. 5% NaCl. When soybean was cooked in McIlvaine's buffer solns. contg. 5% NaCl and contg. 5% NaCl plus 1% glutamic acid, and in soy sauce soln. contg. 5% NaCl, soybean in the soy sauce soln. was hardest.
CA, V. 83, 1975: 176930f

NARAHU, T.; HAYAKAWA, J.; et al.
Gas-chromatographic analysis of sodium lauryl sulfate in soy sauce. (Aichi Prefect. Inst. Public Health, Nagoya, Japan). Shokuhin Eiseigaku Zasshi 1965, 6(5), 420-3 (Japan).

A thermal-cond. detector, a column packed with 25% P.E.G. 6000 (1 m.), 30% P.E. succinate ester (2 m.), or 30% high vacuum silicone grease (1 m.) on 80-100-mesh Celite 545, operated at 180°, and a 36 ml./min. He flow rate were used for the detn. of Na lauryl sulfate (I) added illegally as a preservative in soy sauce. I in 500 ml. soy sauce was hydrolyzed with 50 ml. HCl by refluxing the mixt. for 3 hrs. After cooling, the mixt. was extd. with 3 X 200 ml. ether, the combined ext. washed with 3 30-ml. vols. H_2O, dried with anhyd. Na_2SO_4, ether evapd., and the residue, in 5 ml. EtOH, detd. The calibration curve obtained by the area ratio of I and butylparaben (internal standard) was linear up to $\sim$150 g I and the limit of detection was $\sim$50 ppm.
CA, V. 64, 1966: 14861c

NODA INSTITUTE FOR NUTRITION RESEARCH
A nutrient rich in vitamins and enzymes from koji for making shoyu. Japan. 153,338, Oct. 28, 1942.

The spores filtered out from the koji after heating 1 hr. below 60° and then at 90° for 20 min. were added to a weakly acidic dil. EtOH ext. of the residue to give a solid which after being dried at low temp. and powdered contained vitamins A and D (5 times the amts. in the spores), B_1 and B_2 (lactoflavin 7.0 γ/0.1 g., free and esterified B_1 10.0 γ), oxidized and reduced C (0.5 mg.), amylase (about 4 times the Japanese Pharmacopeia Standard), trypsin (about 6 times) and lipase (about 3 times the B.P. standard).
CA, V. 43, 1949: 5132^d

NOMURA, K.; UEHARA, J.; et al.
Analysis of soy sauce. V. Colorimetric determination of levulinic acid using vanilin in the presence of concentrated sulfuric acid. (Kikkoman Shoyu Co., Ltd., Noda, Japan). Nippon Nogei Kagaku Kaishi 1966, 40(9), 331-5 (Japan); cf. CA 63, 7579h.

When 1 ml. of a levulinic acid (I) soln. contg. 0.7 mg./ml. was heated with 2 ml. of a reagent contg. 0.5 g. vanilin in 100 ml. H_2SO_4 at 100° for 5 min., a highly stable blue color with an absorption max. at 610 m u appeared, and absorbance showed a linear relation to the amts. of I. The amts. of I in com. soy sauces were examd as follows. The soy sauces were extd. at pH 3 with Et_2O for 6 hrs. The aldehydes, alcs., and other org. interfering substances in the exts. were oxidized with 0.2N $K_2Cr_2O_7$ and H_2SO_4. The slightly brown soln. was extd. with Et_2O, and I was assayed in the exts. I recovery from soy sauce was 98.3%. Naturally brewed and chem. hydrolyzed soy sauce samples contained 10 and 670 mg. of I/100 ml., resp.
CA, V. 66, 1967: 1708^r

OBATA, Y.
Flavors of shoyu (soy sauce). (Hokkaido Univ., Sapporo). J. Soc. Brewing, Japan 1956, 51, 39-45.

A review with 39 references.
CA, V. 50, 1956: 12395 h

OBATA, Y.; YAMANISHI, T.
Flavors of soy sauce. I. Flavors developing from hydrolyzed protein and amino acids. (Hokkaido Univ., Sapporo). J. Agr. Chem. Soc. Japan 1951, 24, 226-9.

Ordinary distn. methods of collecting flavors of soy sauce might have destroyed the delicate compds. The flavors of fermented foods should have been produced from specific components by microorganisms. On examg. the flavor which developed in the fermenting yeast juice mixed with various kinds of amino acids added separately or jointly, O. and Y. could detect the soy-sauce-like flavor attributable to 3-methylmercaptopropyl alc., $MeSCH_2CH_2CH_2OH$, when L-methionine was added alone. A similar flavor was detected when cystine or a soln. of hydrolyzed human hair was added. By singeing saccharides (xylose, glucose, or glycerol) mixed with some amino acids, some odor was produced; soy-sauce-like flavor could be detected exclusively when L-methionine or L-cystine was mixed. The odors produced when L-cystine was made to react with HCHO, acetaldehyde, paraldehyde, crotonaldehyde, or furfural at 160° or at 110-130° were tested, but no soy-sauce-like flavor was found.

II. The flavors of the compounds obtained by the reaction of mercaptan with aldehydes. Ibid. 334-8.

The soy-sauce-like flavor due to $MeSCH_2CH_2CH_2OH$ could be obtained from the action of yeast on L-cystine, presumably through MeSH. MeSH or EtSh was made to react with aldehydes presumably present in soy-sauce mash, and the odor of the compds. formed was tested. Prepn. of MeSH by the method of Klason (Ber. 20, 3407(1887)) and the method from thiourea and Me_2SO_4 (cf. Leicesther, C.A. 32, 8384^5) gave 21 and 81% yield, resp. Half mercaptals, RCH(OH)SR', obtained by treating 1.1 M MeSH(R' = Me) with 1 M aldehyde, had no soy-sauce-like flavor but a somewhat picklelike odor, and they were not purified nor identified (R = Me, Me_2CHCH_2, or 2-furyl). Mercaptals, $RCH(SR')_2$, prepd. by treating 1.1 M R'SH with 1 M half mercaptal in the presence of $ZnCl_2$ followed by Et O extn., had odors somewhat different from that of soy sauce: acetaldehyde methylmercaptal (R = R' = Me), sweet-picklelike odor; isovaleraldehyde methylmercaptal (R = Me_2CHCH_2), volatile odor like that of moldy soy sauce, but dil. aq. soln. like half mercaptal; furfural methylmercaptal (R = 2-furyl), saucelike flavor; acetaldehyde ethylmercaptal (R' = Et), disagreeable odor; isobutyraldehyde ethylmercaptal, woody odor. $MeSCH_2CH_2CH_2OH$ and $MESCH_2CH_2CHO$ were synthesized by the method of Akabori (J. Chem. Soc. Japan 1938, 59, 1139 and that of Kaneko and Mii (C.A. 33, 2106^1) had soy-sauce-like flavor (bad odor) and bad odor, resp. The trials to oxidize kojic acid to aldehyde were unsuccessful; the mild oxidizing agents tested were phenylhydroxylamine sulfonic acid, nitrosodimethylaniline, H_2O_2 and $FeSO_4$, methylene blue, and sunlight. Qual. tests showed that soy-sauce flavor was unstable to alkalies, stable to acids, could be adsorbed by animal charcoal (Et_2O soln. of adsorbed matter adsorbed Br_2), and could form osazone.

III. Syntheses of unsaturated aldehydes and ketones. Ibid. 479-81.

Unsatd. aldehydes and ketones were synthesized by condensation of the aldehydes known to be present in soy sauce. Condensate of furfural with AcH, b_{14} 135°, m. 55°, yield 24.4%, odor like that of cinnamaldehyde; condensate of furfural with isovaleraldehyde, b_{15} 128°, yield 10%, soy-sauce-like good flavor; condensate of furfural with acetone, yield 55%, flowerlike flavor; condensate of 2 mols. AcH, i.e. crotonaldehyde, somewhat similar flavor to that of soy sauce; condensate of 2 mols. isovaleraldehyde, b_{20} 145°, yield 16%, terpene-resinlike odor; condensate of crotonaldehyde with isovaleraldehyde, b_{12} 85-120°, yield 8.3%, soy-sauce-like flavor; condensate of crotonaldehyde with Me_2CO, b_{12} 73-5°, yield 16%, soy-sauce-like, but sweet and acid flavor. Further, crotonaldehyde was treated with MeSH to give the products, b_{17} 31° (picklelike odor) and b_{14} 85-90° (soy-sauce-like sweet flavor), which jointly had soy-sauce flavor.

IV. The conditions of the development of soy-sauce flavor. Yataro Obata, Sadao Sakamura, and Tei Yamanishi. Ibid. 1951, 25, 8-12

Several kinds of soy-sauce yeast isolated from ripening soy-sauce mash were employed to det. the conditions of the development of soy-sauce flavor. Addn. of 5-10% NaCl was necessary to obtain the good flavor by the action of such yeasts on casein hydrolyzate. Addn. of soybean oil, glycerol, or palmitic acid to the fermentation medium was effective in obtaining soy-sauce flavor, while addn. of butyric acid, isovaleric acid, or Et esters of olive-oil fatty acids was not. Addn. of 1% L-leucine, L-methionine, or L-cystine to Ehrlich's mineral medium was effective in giving soy-sauce flavor to some extent.
CA, V. 46, 1952: 11474f

OKAMOTO, T.

Determination of sodium cyclamate in soy sauce by gas chromatography. (Kagawa Prefect. Ferment. Food Exp. Stn. Uchinomi, Japan). Kagawa-Ken Hakko Shokuhin Shikenjo Hokoku 1970, (62) 32-6 (Japan)

Place 1-2 ml soy sauce or soln. contg. 0.25-2.0 mg Na cyclamate (I) in stoppered centrifuge tube, cool with ice water, add ice-cooled 10% H_2SO_4 and 10% $NaNO_2$ (3 ml each) and hold at 0-3° for 20-60 min. Add 2 ml nonane-hexane (1:20), shake for 1-2 min, and centrifuge for 1 min at 3000 rpm. Dry the hexane layer with anhyd. Na_2SO_4 and inject 1 µl into a gas chromatograph with a column of 1.5% SE-30 on Chromosorb W. The column temp. was 40°, and flow rates of carrier N and H were 40 and 20 ml/min. The recovery rates of 0.5-2.0 mg I by this method were 100-102.4%. Com. soy sauce, 8, 14, and 3 samples, contained 0, < 1, and < 1.3 mg I/ml, resp.
CA, V. 75, 1971: 150389w

OKAMOTO, T.

Determination of saccharin sodium in soy. (Kagawa-Ken Hakko Shokuhin Shikenjo Hokoku 1973, 64, 56-60 (Japan).

Saccharin in soy sauce was detd. by column chromatog., gas chromatog., and by organoleptic tests. Acidified soy sauce was satd. with NaCl and extd. with $CHCl_3$. The ext. was dried over Na_2SO_4, and the solvent removed by evapn. Water was added to the residue and used for column chromatog., or methylated and subjected to gas chromatog. Acidified samples were extd. with ether. The ether was dried and removed by evapn. An aq. soln. was neutralized and tested organoleptically. Column chromatog. using an AG 1 x 2 column and developed with EtOH-0.2N HCl (1:1) gave quant. recovery in the range of 0.1-1.0 mg Na saccharin. No interference by preservatives such as benzoic acid or by artificial sweetners such as cyclamate was obsd. Gas chromatog. using Shimazu GC-1CHID with XE-60 chromosorb DHCS column and using anthracene as an internal std. gave a linear response up to 10 mg. The organoleptic test detected 5 ppm saccharin.
CA, V. 81, 1974: 48608d

OKAMOTO, T.
Determination of sucrose in soy. Kagawa-Ken Hakko Shokuhin Shikenjo Hokoku 1973, 64, 61-5 (Japan).

Sucrose in soy sauce was converted to reducing sugar and detd. colorimetrically with 3,5dinitrosalicylic acid. Methods of hydrolysis by HCl and by invertase were compared. For complete acid hydrolysis a pH of 2.4 or lower was needed. Under such conditions, hydrolysis of starch and dextran also occurred. The more specific enzymic method was as follows: to 1 ml of soy sauce contg. 20-200 mg sucrose/ml there was added 1 ml invertase (BDH or Sankyo) dild. 1:1 in phosphate buffer at pH 4.0-4.5. The mixt. was incubated at 30° for 30 min.
CA, V. 81, 1974: 48609e

OKAMOTO, T.; TAKEGAMI, I.
Analysis of sugars in soy sauce by liquid chromatography. (Kagawa Prefect. Ferment. Food Exp. Stn., Uchinomi, Japan). Kagawa-Ken Hakko Shokuhin Shikenjo Hokoku 1972, (63), 55-61 (Japan).

Sugar compns. in soy sauce mash fermented for 2, 6, and 10 months and analyzed in August were similar; they contained glucose 1874-1976 (58.9-62.0), galactose 660-742 (21.5-23.3), arabinose 238-290 (7.6-9.1), xylose 221-223 (6.9-7.2), ribose 35-53 mg/dl (1.1-1.6% of total sugars), and small amts. of maltose, rhamnose. By heating mash fermented for 10 and 12 months at 80° for 3 and 5 hr, resp., 46-49% of the xylose, 20-22% of the arabinose, 14-25% of the ribose, 12-18% of the glucose, and 13% of the galactose were lost. The change of 16 amino acid contents in mash after heating was very small. Main raw materials of soy sauce such as defatted soybean, soybean seed coat, wheat, wheat bran, barley, and dried sweet potato were hydrolyzed and sugar compns. were detd.
CA, V. 78, 1973: 146448j

OKUHARA, A.; HARADA, M.; et al.
Color of soybean sauce. I. Pigment adsorption on acid clay. (Cent. Res. Lab., Kikkoman Shoyu Co., Ltd., Noda, Japan). Hakko Kogaku Zasshi 1969, 47(1), 50-6 (Japan).

A method for decolorization of soy sauce by Japanese acid clay was discussed. Acid clay adsorbs pigment from soy sauce, but it hardly adsorbs the flavor of soy sauce. The optimum pH value for this decoloring action was from 5 to 3.5. The pigment formation in soy sauce treated with acid clay was less than that in untreated sauce. The formation of lees in untreated raw soy sauce concluded in 3 to 5 hrs. at 60-80°, but it concluded in 30 min. at 80° in soy sauce treated with acid clay. Therefore, the acid clay treatment is a useful method for the pasteurization of colored soy sauce.
CA, V. 70, 1969: 95563t

OKUHARA, A.; NAKAJIMA, T.; et al.
Color of soybean sauce. II. Stability of color. (Cent. Res. Lab., Kikkoman Shoyu Co. Ltd., Noda, Japan). Hakko Kogaku Zasshi 1969, 47(1), 57-68 (Japan).

The color and color stability of soy sauce were discussed. The concn. of residual sugar, which had not been consumed by microorganisms during the brewing process, was related to the pigment concn. in raw soy sauce. The correlation coeff. (γ) was 0.688 and significant at the 1% level. The pigment concn. of raw soy sauce related to the velocity of the pigment formation. In this case the γ was 0.604. The pigment concn. of pasteurized soy sauce related to the velocity of oxidative pigment formation, of which γ was 0.439 and significant at the 5% level. Glucose was added to raw soy sauce at several concns. and the mixts. were heated at 80°. In spite of this treatment the velocity of pigment formation remained the same as that in raw soy sauce without glucose. Glucose, the main component of residual sugar, did not relate to the pigment formation. Pentose in raw soy sauce contributed only 10-20% of the total pigment formation. Sufficiently fermented soy sauce during its mash stage is stable in color. Fading was observed when soy sauce was diluted and exposed to the air. The colors of raw, pasteurized, oxidized, and faded soy sauces were estd.
CA, V. 70, 1969: 95564u

OKUHARA, A.; SAITO, N.
Color of soy sauce. III. Effect of reducing reagents on browning of soy sauce. (Cent. Res. Inst., Kikkoman Shoyu Co., Ltd., Noda, Japan). Hakko Kogaku Zasshi 1970, 48(3), 177-89 (Eng).

The effects of heat treatment on browning of soy sauce and of a system consisting of amino acids and xylose were investigated. Nonoxydative browning of soy sauce was depressed by reducing agents such as sulfite, -SH compds., Raney Ni, and endiol compds. Strong reducing agents such as -SH compounds, borohydride, ascorbic acid, and protocatechuic acid decolorized browning pigment of pasteurized soy sauce even at room temp. These strong reducing agents, with the exception of protocatechuic acid, also decolorized raw soy sauce at room temp.
CA, V. 72, 1970: 120130a

OKUHARA, A.; SAITO, N.
Color of soy sauce. IV. Decolorization and depression of browning by reduction. (Cent. Res. Inst., Kikkoman Shoyu Co., Ltd., Noda, Japan). Hakko Kogaku Zasshi 1970, 48(3), 190-201 (Eng).

The decolorization of the browning pigment and depression of browning by redn. are described in this report. The browning pigment of soy sauce and concd. apple juice were reduced with metals such as Zn, Al, Fe, Sn, Na, and Mg, and by electrolysis to colorless substances. The browning pigments of some liq. foods were also reduced electrolytically to colorless substances. The app. for electrolysis is shown. The browning rate and reductone formation of soy sauce reduced electrolytically under acidic conditions (pH 4-6) were not depressed but were considerably depressed in soy sauce reduced under neutral or alkali conditions (pH 6.5-8). The browning reaction of soy sauce was depressed during electrolysis. In this case, pentose was consumed, but for-

mation of reductone was depressed. Electrolytic oxidn. and redn. of soy sauce were carried out simultaneously, but the browning pigment was decreased to the same level as in electrolytic redn. The redn. of the browning pigment to a colorless substance was an irreversible reaction.
CA, V. 72, 1970: 120131b

OKUHARA, A.; SAITO, N.
Color of soy sauce. VI. Effect of peptides on browning. (Cent. Res. Inst., Kikkoman Shoyu Co., Ltd., Noda, Japan). Hakko Kogaku Zasshi 1971, 49(3), 272-87 (Eng).

The browning of soy sauce is much faster than that of solns. contg. only sugars and amino acids. In soy sauce, a slight amt. of amino acids is consumed in browning. The effect of peptides on browning was studied. Browning of a soln. contg. xylose and glycine was greatly promoted by a small addn. of soy sauce. The peptide soln. used in these expts. was prepd. by hydrolysis of soybean protein with the crude protease from koji (a culture of Aspergillus oryzae on steamed wheat bran). The peptides not only reacted with xylose and browned themselves but also promoted the browning reaction between xylose and glycine. The browning reaction between the peptides and xylose was promoted by increasing the amt. of the peptides. The browning of soy sauce was also promoted by addn of the peptide soln. The mol. size and nature of the peptides in the peptide soln. resembled those in soy sauce, sake, and mirin. The browning rate of soy sauce and its peptide contents are closely related to the relative amt. of mashing salt water used in the mashing process. Peptides are among the most important components in promoting the browning of soy sauce, and some part of the browning of other brewed products is also caused by peptides.
CA, V. 75, 1971: 34131g

OKUHARA, A.; TANAKA, T.; et al.
Color of soy sauce. V. Application of multiple correlation analysis of browning mechanism. (Cent. Res. Inst. Kikkoman Soy Sauce Co., Ltd., Noda, Japan). Hakko Kogaku Zasshi 1970, 48(4), 228-36 (Japan).

The relation between the compn. of soy sauce and its browning rate was analyzed. In order to obtain various concns. of soy sauce components, in the Population I, a great variation in the wt. of koji per material, and in the Population II, a little variation was given to the concn. of salt in mash were produced. The reducing (and browning) capacity(ies) of raw soy sauce was produced by sugar-amino acid reaction and (or) from peptides. A pos. correlation was obsd. between the reducing capacity and reducing sugar. The wt. of koji per unit material and the ratio of koji to mash water affected the compn. of soy sauce.
CA, V. 73, 1970: 54582s

OKUHARA, A.; YOKOTSUKA, T.
Analysis of soy sauce. I. Glycerol. (Noda Soy Sauce Co., Ltd., Chiba-ken, Japan). Nippon Nogei Kagaku Kaishi 1958, 32, 138-43.

Sepn. and extn. of glycerol from soy sauce could be most suitably made by steam distn. in vacuo with rather large amts. of H_2O added, when compared to other methods such as removal cf impurities by pptg. agent, extn. with solvents, and distn. with superheated steam. Sepn. was done especially from mannitol. Sepd. glycerol was detd. colorimetrically after oxidation with HIO_4. The soy sauce brewed from the (nondefatted) soybean contained 10-12 mg. and that from defatted soybean contained 6-7 mg. glycerol/ml.

II. Potentiometric titration of acid ingredients and of formol nitrogen in soy sauce. Toshio Sasaki and Tamotsu Yokotsuka. Ibid. 144-51.

Good results were obtained when the acid content of soy sauce was detd. by potentiometric titration with 0.05N NaOH at the end point of pH 8.2. Formol N was recovered almost 100%, when the mixt. of soy sauce, adjusted to pH 8.5, and formalin of pH 8.5 was potentiometrically titrated to pH 8.5. In this case the final concn. of formalin should be 9-15%.
CA, V. 54, 1960: 10231g

OKUHARA, A.; YOKOTSUKA, T.
Analysis of soy sauce. III. Estimation of total polyols in soy sauce. (Soy Sauce Co., Ltd., Noda, Japan). Nippon Nogei Kagaku Kaishi 1962, 36(4), 320-6; cf. CA 54, 10231g.

In order to det. the polyols on soy sauce, amino acids, org. and inorg. acids NaCl, and reducing sugars was removed by passing through columns of excess amts. of ion-exchange resins such as Amberlite IR-120 and CG 400 Type I. The isolated 5 x 10^{-5}-10^{-3}% polyols were oxidized with HIO_4 and HCHO and detd. colorimetrically with chromotropic acid (Neidig and Hess CA 47, 4587f). Polyol content in soy sauce koji varied from 27 to 65 mg/g dry matter as glycerol and glycerol contents varied from 46 to 81% of the total polyols. Polyol contents in mash juice varied from 9 to 12 mg/g as glycerol, and glycerol contents in the total polyols were 75%. In some cases, the polyol content in mash juice increased rapidly from 10 to 18 mg/ml during fermentation. The increased portion of polyol content decreased during aging, but glycerol gradually increased during all periods. The polyol contents, mostly glycerol, in soy sauce calcd. as glycerol ranged from 12 to 13 mg/ml for those prepd. from deffated soybeans and wheat, and from 16 to 19 mg/ml for those prepd. from whole soybeans and water.
CA, V. 61, 1964: 13808g

OKUHARA, A.; YOKOTSUKA, T.
Analysis of soy sauce. IV. Quantitative determination of process soybean sauce in soybean sauce on the market. (Soy Sauce Co., Ltd., Noda, Japan). Nippon Nogei Kagaku Kaishi 1963, 37(10), 585-90 (Japan); cf. CA 61, 13808g.

For the detn. of process soybean sauce in the soybean sauces on the market, the compds. which were present in process soybean sauce and absent in fermented soybean sauce were estd. As such compds. levulinic acid and HCO_2H were selected, because they

existed largely in process soybean sauce and were stable in soybean sauce. These acids were produced from starch or sugars by heating with HCl; and were detd. by a convenient process as follows: soybean sauce was acidified with H_2SO_4 or HCl and extd. with ether for 48-60 hrs. The HCO_2H fraction was isolated by partition chromatography on a silica column and detd. by titration. HOAc and levulinic acid were difficult to sep. by this method. The conditions for the detd. of total carbonyl were investigated in the presence of large amts. of org. acids, and the method of Fritz (F., et al., CA 53, 11115a) was found to be most appropriate. Levulinic acid contents by this method in the fermented and process soybean sauces were 0.003 and 0.046-0.05 meq./ml. total N. Quant. detn. of process soybean sauce in soybean sauce by the detn. of levulinic acid was superior than that by the detn. of HCO_2H because of the volatility of the latter.
CA, V. 63, 1965: 7579h

OKUHARA, A.; YOKOTSUKA, T.
Flavoring substances in soy sauce. XXII. The differences between the soy sauce made from soybean and wheat and that made from defatted soybean and wheat. (Noda Soy Sauce Co., Ltd., Chiba, Japan). Nippon Nogei Kagaku Kaishi 1963, 37(5), 255-61 (Japan); cf. CA 60, 11290a; 61, 13808g.

The reason for soy sauce made from defatted soybean and wheat (I) containing more org. acids and less alc. than soy sauce made from soybean and wheat was investigated. The addn. of normal C_{6-12} satd. fatty acids in 5% concn. suppressed the formation of both org. acids and alc. in the fermentation of mash juice, whereas C_{14-18} acids suppressed only org. acid formation. Org. acid formation was suppressed by the addn. of 2.5% oleic, linoleic, and linolenic acids. Org. acid formation was not suppressed markedly by the addn. of soybean oil, soy sauce oil, and ester and unsaponifiable fractions of soybean oil. When koji was prepd. from defatted soybean and wheat, and mash was prepd. from this koji and soy sauce oil hydrolyzate, org. acid formation was not suppressed. In order to suppress the org. acid formation during mash fermentation, it was essential that koji be prepd. from defatted soybean and wheat in the presence of soy sauce oil hydrolyzate. When org. acid formation was suppressed during the fermentation of mash, alc. formation proceeded. The mash prepd. from defatted soybean showed the highest content of org. acids and the lowest content of alc., that of crushed soybean showed medium contents of org. acids and alc., and that of whole soybean showed the lowest content of org. acids and the highest content of alc. The addn. of stearic acid to koji did not stimulate the activity of yeast but suppressed the activity of bacteria and the formation of org. acids.
CA, V. 62, 1965: 16886a

OMATA, S.; UENO, T.
The color of soy sauce. I. Its change when treated with active charcoal. (Naniwa Univ., Sakai). J. Agr. Chem. Soc. Japan 1953, 27, 570-5 .

The color of soy sauce was studied spectrophotometrically. Dominant wave length 590-620 mμ, excitation purity 86-88%, and luminous transmittance 0.14-0.17 were obtained. Stronger absorption was observed in the shorter wave length and weaker in the longer wave length in the visible spectrum. No specific peak of absorption was observed. by treatment with active charcoal a difference in color was found between brewed soy sauce and amino-acid condiments (chem. soy sauce); the former showed characteristic absorption effect in the longer wave length.

II. Factors causing color change during storage. Ibid. 575-80.

Air was chiefly responsible for color change during storage, while light and temp. had no remarkable effects. The form of transmittance curve did not change when the color was deepened by aeration. The change of color during storage did not seem to be due to enzymic reaction.
CA, V. 49, 1955: 15164e

OMATA, S.; UENO, T.; et al.
The color of soy sauce. III. Substances increasing the color intensity of soy sauce. (Naniwa Univ., Osaka). Nippon Nogei-Kagaku Kaishi 1955, 29, 165-8; cf. C.A. 49, 15164e.

Compds. which increase the color intensity of soy sauce (I) were sepd. as 2,4-dinitrophenylhydrazones and characterized by paper chromatography and ultraviolet absorption. It was found that several carbonyl compds. promote the darkening of I; these were composed of 13 aldehydes and 4 ketonic acids, of which AcH was identified, and the presence of crotonic aldehyde, diacetyl, and levulinic acid was presumed. Others were not identified.

IV. The effect of furfural on the color of soy sauce. Ibid. 215-19.

2-Furaldehyde (II) in I is detd. spectrophotometrically during the course of brewing, and the effect of II on the color of I was studied. The II present in raw materials of I were slightly decreased in late stage of brewing and increased on pasteurization. 5-Hydroxymethyl-2-furaldehyde and 5-methyl-2-furaldehyde were not natural components of I; the latter was formed on pasteurization. II increased the color intensity of I, but the mechanism of formation of coloring matters from II was complicated; it was not an autoxidation of II nor a simple reaction of II with amino acids or aldehydes.

V. Effect of reductone on the color of soy sauce. Ibid. 251-6.

The effect of reductone on the color of I was studied. Triose reductone, ascorbic acid (III), and dehydroascorbic acid (IV) were used as reductones or dehydroreductones. Considerable variation in III contents was observed during brewing of I, and it was confirmed that III and IV had a darkening effect on I, the effect being larger for IV than for III. A coloring substance is formed from III or IV through reaction with amino acid in I. The activity of tyrosine to react with III was high, and the reaction is promoted by Fe. The following sequences were presumed for coloring mechanism: III is oxidized by aeration to IV, the latter is then decompd. into intermediates which react with amino acids to form coloring substances through an oxidative reaction. 2-Furaldehyde and 2,3-dioxogulonic acid were excluded from being the intermediate decompn. products.

VI. Soy-sauce pigment. 1. Ibid. 256-60.

Pigments in I were sepd. with paper and column chromatography into 2 fractions, F_I and F_{II}; the former was an acidic substance and the latter a basic. R_f in the paper chromatography with 50% EtOH was 0.54-0.56 and 0.68-0.70 for F_I and F_{II}, resp. When chromatographed on a column consisting of Al_2O_3 and fuller's earth (3:1) with 50% EtOH as a developer, F_I was adsorbed on the column while F_{II} eluted out. A much larger amt. of F_I than F_{II} was present in I. While both pigments increased during brewing, the increase of F_I was larger than that of F_{II}. F_I was formed by a reaction between sugars (hexose and pentose) and amino acids, but F_{II} was supposed to be formed mainly by a reaction of leucine with xylose. Reactivity of pentose and lysine was the highest in sugar-amino acid reactions.
CA, V. 52, 1958: 8448g

OMATA, S.; UENO, T.; et al.
Browning reaction of soysauce. VIII. Browning reaction of soy sauce koji. 1. (Osaka Prefect. Univ.). Nippon Nogei-Kagaku Kaishi 1957, 31, 822-6; cf. C.A. 52, 8448g.

The coloring of soysauce is affected by C/N ratio of raw materials; the color intensity is increased with lower C/N ratio. Properties of koji molds used in manuf. give some effects on coloring. Substances which participate in the browning of soysauce during manuf. are amino acids, reducing sugars, reductones, and carbonyl compds. Phenols or autolyzates of fungal cells have little effect, and the participation of tyrosinase in browning reaction is excluded.
CA, V. 52, 1958: 16688c

ONAGA, D.M.; LUH, B.S.; et al.
Quality evaluation and chemical composition of soy sauce. (Univ. of California, Davis). Food Research 1957, 22, 83-8.

NaCl, acidity, and N content are important factors influencing flavor acceptance. Amino acids as identified in soy sauce are alanine, arginine, aspartic acid, glutamic acid, glycine, leucine, lysine, methionine, phenylalanine, proline, serine, threonine, and valine. Of these, glutamic acid, alanine, leucine, and aspartic acid are present in larger quantities than the others. The importance of various constituents to flavor in discussed.
CA, V. 51, 1957: 17080e

ONISHI, T.
Change of aroma and color during processing of soy sauce. III. Effect of added ethyl alcohol on the quality of soy sauce. (Kagawaken Ferment. Food Exp. Stn., Takamatsu, Japan). Chomi Kagaku 1972, 19(2), 30-5 (Japan).

The addn. of EtOH to raw soy sauce gave satisfactory results for improvement of the flavor and shelf-life when the ultimate concn. of EtOH was 3 wt. % of the finished soy sauce. When added after pasteurization, unfavorable changes of the flavors were detected by sensory test and gas chromatog. A large amt. of ppt.was formed with the remaining protein after pasteurization and was eliminated by filtration with 0.15-0.25% diatomaceous filter aid.
CA, V. 80, 1974: 106947f

ONISHI, T.

Change of aroma and color during soy sauce processing. III. Effect of added ethyl alcohol on the quality of soy sauce. (Kagawa Prefect. Ferment. Food Exp. Stn., Uchinomi, Japan). Kagawa-Ken Hakko Shokuhin Shikenjo Hokoku 1972, (64), 1-7 (Japan).

After 1-3% EtOH was added to brewed soy sauce contg. 1.8% EtOH and pasteurized at 80° for 9 hr, the soy sauce was tested by sensory test after storage for $\geq$ 20 days; the fragrance of soy sauce increased and the taste decreased with increases in the amt. of EtOH added. Considering the anti-mold activity of EtOH, the optimum EtOH concn. was assumed to be 3%. After addn. of EtOH and pasteurization of soy sauce, the amt. of pptn. increased with the increase of EtOH, with the decrease of pH from 4.9 and 4.5, and with an increase in concn. of NaCl from 18 to 24%. The pptn. sedimented well upon addn. of 3-5 kg Celite/18 kl soy sauce.
CA, V. 79, 1973: 103799c

ONISHI, T.

Changes in aroma and color during the processing of soy sauce. IV. Changes in the aroma of the hydrolyzate of soybean meal by heating. (Kagawa Ferment. Food Exp. Stn., Takamatsu, Japan). Chomi Kagaku 1973, 20(3), 21-6 (Japan).

The taste and amino acid compn. of the hydrolyzate of soybean meal did not change by heating at 80° for 10 hr, but the amino acid odor increased and the aroma decreased. Gas chromatog. (4 mm x 2.25 m glass column packed with PEG 600, carrier gas 25 ml. N_2/min., H_2 flame ionization detector, column temp. 40°, injector temp. 70°, detector temp. 70°) revealed that dimethylsulfide (I) [75-18-3] and iso-butyraldehyde (II) [78-84-2] in the hydrolysate increased on heating, but stirring during heating or heating at pH 4.7-5.1 suppressed the increase. On storage of the hydrolyzate at 30° for 60 days, I and II were increased by 60 and 30%, resp.
CA, V. 83, 1975: 176927k

ONISHI, T.

Changes in aroma and color during soy sauce manufacture. 4. Changes in the aroma of a neutral refined soybean meal hydrolyzate during heating. (Kagawa-Ken Hakko Shokuhin Shikenjo Hokoku 1973, 65, 1-7 (Japan).

Changes in the aroma, esp. development of off-flavors, during heating were studied by gas chromatog. Thus, Me_2S and isobutyraldehyde increased rapidly in 25 hr of heating of the amino acid soln. However, this rapid increase was not obsd. at pH 4.7-5.1. The in-

crease was prevented by stirring during heating or by cooling rapidly immediately after heating.
CA, V. 81, 1974: 48698h

ONISHI, T.
Color formation by oxidation of soy sauce. (Kagawa Ken Ferment. Food Exp. Stn., Takamatsu, Japan). Chomi Kagaku 1971, 18(6), 239-44 (Japan).

Browning of soy sauce was accompanied by off-flavors, decrease of AcOEt concn. and increase of carbonyl compds. Browning proceeded even at - 10° in air, but not without air at 10°. Covering the surface of the bottled soy sauce with a floating plastic sheet prevented browning by cutting off contact with air.
CA, V. 80, 1974: 106946e

ONISHI, T.
Color increase of soy sauce. I. Pigment formation by heating. (Kagawa Prefect. Ferment. Food Exp. Stn., Uchinomi, Japan). Kagawa-Ken Hakko Shokuhin Shikenjo Hokoku 1970, (62), 12-8 (Japan).

When brewed raw soy sauce was heated in covered test tubes at 50-90° for 2-90 hr, the rate const. for pigment formation measured at 500 mμ increased to about 300% with an increase of the reaction temp. of 10°. Organoleptic anal. showed that the color and aroma of raw soy sauce heated at 80° for 11 hr were most acceptable. Similar flavor was found in soy sauce samples having almost the same color intensity caused by heating at 60-90° for 2-87 hr. Color intensity of raw soy sauce after heating was higher when the N content was higher. When an increase in pH from 4.6 to 5.2, the color intensity after heating increased. The color increase after heating was not found in the samples exposed to air at 30° for 2 weeks. Color intensity was increased by the addn. of up to 10% glucose to raw or acid-hydrolyzed soy sauce, but the addn. of 2% glucose to raw soy sauce caused a color increase of < 5% after heating. The greater the surface area during heating at 80° for 9 hr, the higher was the color intensity and the worse the aroma.
CA, V. 75, 1971: 150418e

ONISHI, T.
Utilization of sweetners for soy sauce. (Kagawa Prefect. Food Exp. Stn., Uchinomi, Japan). Kagawa-Ken Hakko Shokuhin Shikenjo Hokoku 1970, (62), 1-6 (Japan)

The sweetness of mixed soy sauce (brewed:acid-hydrolyzed = 1:1) contg. 150 g Na cyclamate and 15 g sol. saccharin/180 l. was same as that contg. saccharin 42-57, licorice flake 122-50 g, or 15-19 kg sucrose/180 l. Soy sauce with only licorice flake was not acceptable, and that with 75% saccharin and 25% licorice flake was more acceptable than that with saccharin 50, licorice flake 25, and sucrose 25%. Bitterness was noticed in soy sauce with > 100 g saccharin/180 l. Heating of soy sauce contg. 75 or 150 g saccharin at 80° for 11 hr did not affect the taste.
CA, V. 75, 1971: 150417d

ONISHI, T.; MIYOSHI, H.
Artificial sweeteners for soy sauce. (Kagawa Prefect. Ferment. Food Exp. Stn., Uchinomi, Japan). Kagawa-Ken Hakko Shokuhin Shikenjo Hokoku 1969, (61), 29-35 (Japan).

The use of Na cyclamate and Na saccharin as artificial sweetneners for soy sauce in place of dulcin was studied organoleptically. The sweetness of soy sauce contg. 40 g. dulcin/180 l. soy sauce was same as that of soy sauce contg. 127 and 68 g saccharin when tested at 1:2 and 1:10 dilns., resp., and was the same as that contg. 490 and 430 g cyclamate, resp. The sweetness of soy sauce contg. 300 g cyclamate and 30 g saccharin/180 l. showed good quality and was same as that contg. 557 g cyclamate when tested at a 1:2 diln. It decreased with the decrease of pH of soy sauce from 5.0 to 4.6. The sweetness of soy sauce contg. 130 g saccharin or 500 g cyclamate remained unchanged after heating soy sauce of pH 4.6-5.0 at 80° for 30 min or after storage at 40° for a month. By addn. of 20 g 5'-ribonucleotide prepn./180 l. soy sauce contg. 360 g cyclamate and 36 g saccharin, the sweetness of soy sauce increased to 120% when tested at a 1:10 diln.
CA, V. 74, 1971: 30834v

ONISHI, T.; OKAMOTO, T.; et al.
Change of alcohol content during processing of soy sauce. (Kagawa Prefect. Ferment. Food Exp. Stn., Uchinomi, Japan). Kagawa-Ken Hakko Shokuhin Shikenjo Hokoku 1970, (62) 7-11 (Japan).

The EtOH content of brewed raw soy sauce decreased from 2.105 to 1.862 g/dl after standing for 10 days at 25-6° and from 1.628 to 1.587 g/dl at 16-19° in open vessels. After pasteurization in a closed vessel, the EtOH content decreased from 1.833 to 1.794 g/dl and in an open vessel to 1.318 g/dl after 1 hr. Soy sauce contg. more EtOH and EtOAc had better flavor. The lag of EtOH content decreased linearly with increasing stirring time up to 60 min, and the higher the temp. of the soy sauce the greater was the loss of EtOH from the soy sauce. Covering the vessel reduced the loss from 52.1 to 17.4%.
CA, V. 75, 1971: 150416c

SAITO, N.; TANAKA, T.
Sensory evaluation of soy sauce. III. Construction of a quality pattern based on the chemical factors. (Kikkoman Shoyu Co., Ltd., Noda, Japan). Hakko Kogaku Zasshi 1967, 45(11), 1033-9 (Japan).

Soy Sauce has many chem. factors, and variance of chem. factors can be described in full by several principal components. The Principal Component Anal technique is applied to the data from chem. anal. of about 120 samples.
CA, V. 69, 1968: 18134f

SAIZUKA, H.
Prevention of the development of floating matter in soy sauce by the solubilization of butyl p-hydroxybenzoate. (Maruzen Kasei Co., Onomichi, Japan). Chomi Kagaku 1967, 14(6), 13-5 (Japan).

Bu p-hydroxybenzoate (I) could be made sol. in H_2O by adding glycyrrhizin (II) or the ext. of roots and stems of Glycyrrhiza uralensis, and the solubilized I could prevent the formation of floating matter in soy sauce. The antifungal properties of I were improved. The soy sauce flavor was also improved by the sweet tasted of II.
CA, V. 73, 1970: 43981v

SASAKI, T.; IIKURA, Z.; et al.
Detection and determination of levulinic acid in shoyu. (Kikkoman Shoyu Co., Chiba, Japan). Chomi Kagaku 1968, 15(5), 1-5 (Japan).

Levulinic acid (I) may be detd. colorimetrically by the vanillin-H_2SO_4 method according to Nomura, Uehara, Iikura, and Yokotsuka (1966). A sample of shoyu showed 3.925% I by this method. This paper describes a simpler method for detecting I in shoyu. Adjust 10 ml shoyu to pH 2.50. Ext. I with 40 ml EtOAc by shaking for 10 min. The recovery of I is nearly const. (about 80%). Detect by the vanillin-H_2SO_4 method or by reaction with NH_2NH_2 (absorption 242 mμ). The lower limit of detection was 0.2% by both methods.
CA, V. 73, 1970: 33924q

SASAKI, T.; IIKURA, Z.; et al.
Determination of dulcin in soy sauce and similar seasonings. (Kikkoman Shoyu Co., Noda, Japan). Chomi Kagaku 1969, 16(2), 6-10 (Japan).

Dulcin (I) is no longer permitted as an artificial sweetener in Japan, so methods of detg. I were re-examd., and compared with paper chromatog. with $BuOHNH_4OH$ (4:1) as the solvent and p-dimethylaminobenzaldehyde (II) in HCl as the spray reagent. The methods examd. were the β-naphthol method of Hayashi (1967), and the II method of Hayashi and Takeshita (1968). More than 5 ppm I could be detected by paper chromatog. The β-naphthol method had more interferences than the II method. Values > 10 ppm were reliable for com. soy sauce and mixed seasonings for Japanese noodles, while values > 100 ppm were reliable for European-style sauces.
CA, V. 73, 1970: 43956r

SATO, K.
Determination of sodium chloride in soy sauce. I. Direct argentometric titration by the use of adsorption indicator. J. Soc. Brewing, Japan 1955, 50, 411-8.

The Cl content of soy sauce was detd. satisfactorily in acidic soln. (adjusted with AcOH to pH 2.7-3.4) by the titration with 0.02N $AgNO_3$ soln. in the presence of bromophenol blue as adsorption indicator. The results were accurate in the presence of amino acids, peptones, peptides, proteins, amines, acetals, ketones, aldehydes, carbohydrates, alcs., org. acids, furfural, melanines, and their derivs. and polymers. In this case the color change of titration became very sharp by the addn. of peptone. Fluorescein, dichlorofluorescein, Tropeolin OO, and Metanil Yellow were not suitable for soy sauce, because proteins and their hydrolyzates inhibited the color reactions. Fluorescein was

better than bromophenol blue for the detn. of Cl in the ash of soy sauce.
CA, V. 49, 1955: 15164g

SHIKATA, H.; DANJO, M.; et al.
Determination of salt in soy sauce. (Res. Lab., Higashimaru Shoyu Co., Ltd., Tatsuno, Japan). Chomi Kagaku 1974, 21(7), 18-23 (Japan).

For rapid and accurate detn. of NaCl /7647-14-5/ in shoyu, an improved potentiometric titrn. method was investigated. Most accurate results were obtained in the samples contg. 10-20 mg salt. Use of 0.1N $AgNO_3$ and microburet permitted rapid and precise detn.
CA, V. 84, 1976: 103904m

SHIKATA, H.; OMORI, K.; et al.
Color of usukuchi soy sauce. IV. Effect of pH on the browning reaction and nature of fractionated pigments. (Higashimaru Shoyu Co., Ltd., Tatsuno, Japan). Chomi Kagaku 1973, 20(3), 27-35 (Japan).

A browning reaction occurred above pH 400 (max. at pH 5.00-6.00), when a mixt. of 0.3M xylose and 0.3M β-alanine adjusted to pH 3.00-7.00, was left at 70° for 17 hr, and the blue black color became deep with the increase of pH in the range 4.00 to 7.00. The browning substance of the mixt. was sepd. into 2 fractions by gel filtration through Sephadex G 25 with H_2O, and the high mol. wt. fraction converted into the acidic low mol. wt. fraction by heating at 70° for 5 hr. The browning reaction in soy sauce was accelerated with increase in pH to yield a blue black color, and org. acids, esp. acetic [64-19-7] and tartaric acids [87-69-4], promoted browning. The browning substance of soy sauce was sepd. into 3 fractions, and the high mol. wt. fraction decreased and the others increased on further heating at 70° for 17 hr.
CA, V. 83, 1975: 176925h

SHOJI, K.
The flavor of soy. I. Bull. Inst. Phys.-Chem. Research (Tokyo) 1935, 14, 872-7.

In general the aromatic substances of soy are composed of AcOH, $Me(CH_2)_3COOH$, $C_5H_{11}COOH$, AmOH, hexyl and higher alcs., phenolic compds., aldehydes and ketones, the phenolic compds. being the most important constituents.
CA, V. 30, 1936: 1938^1

SHOJI, K.
Flavor of soy sauce. IV. Shokuryo no Kagaku 1949, 3, 33-4; cf. Bull. Inst. Phys. Chem. Research (Tokyo) 1936, 15, 166-70, 223-9; C.A. 30, 1938^1

A highly flavorous fraction, extd. from alkali-sol. components of soy sauce, was warmed with MeOH and $HgCl_2$ soln. at 40-50° for a week to produce a large amt. of yellow ppt. This was a highly

odorous S compd. which became phenolic nitrile when the S was removed. This nitrile gave phenolic acid when hydrolyzed to remove CN.
CA, V. 47, 1953: 7158c

SHURPALEKAR, S.R.
Chemical composition and nutritive value of soyabean and soyabean products. Food Sci. 1961, 10 (3), 52-64.

A study of the literature concerning soybean products (Glycine hispida) recording inter alia, the factors affecting nutritive value, the digestibility and biological value, and the processed foods from soybeans, soybean milk and flour, fermented soybean products, etc. Tables. 178 refs.
Royal Tropical Institute, Amsterdam, i2216.

SINGH, A.N.; MISHRA, M.N.
Soybean and its uses. Indian J. Sci. & Industry 1967, 1 (4), 186-92.

The authors briefly review the wide utilization of the soya bean and its by-products in various parts of the world. Apart from traditional uses as a protein-rich food in the form of flour, sauce, milk or curd, soya bean flakes may be mixed with maize, while flour may be incorporated in ice-cream. The oil component and lecithine are also extensively utilized in food manufacturing. The protein is used in industry, inter alia, for the coating of paper, in plastics, and for the manufacturing of synthetic soya bean fibre. The oil and the protein are both used in paint, ink and linoleum production. Oil by-products such as sterols and tocopherol also find industrial applications. Consumption of fresh, cooked or frozen beans is relatively small. 38 refs.
Royal Tropical Institute, Amsterdam, r2272.

SOEDIGDO, P.; WAWOROENTOE, S.A.; et al.
Penelitian komposisi dan karakteristik kecap, serta proses pembuatannya. (Research on the composition and characteristics of soybean sauce together with the process of making it).Science Meeting on Food Proteins and Soybean Sauce Processing, Bandung, Lembaga Kimia Nasional - LIPI, 1-2 Juni 1972.

Soy-bean sauce forms a very important foodstuff and is much consumed in Indonesia. Tasty stuff like soybean sauce that is well known in other Asian countries is soy-sauce. Reminding one of the raw materials of soybean sauce in therefore research is needed to be carried out on the composition of soybean sauce, principally on its protein content. It is also necessary to consider its process of making because this can affect the mentioned protein content. From these results improvements in the processing methods will be applied later on, if they are deemed to be necessary. The last goal is the understanding that soybean sauce does not only function as a tasty stuff but also forms a valuable source.
Author

TAKATA, R.; IIMA, T.; et al.

Stability of vitamins in "Shoyu" fortified with thiamine and riboflavine. (Kyoto Univ.). Vitamins (Japan) 1956, 10, 200-4.

Changes of thiamine (I) and riboflavine (II) contents during the the storage of Shoyu fortified with 25 mg./1. of each vitamin were detd. monthly for one year. Little loss of I was observed in autumn, winter, and spring, while a certain amt. of loss was recognized in summer, the total loss of I in one year being 10% on an av. Loss of II was less than that of I, being 5% in one year.

CA, V. 50, 1956: 14999h

TAKEDA, R.

Prevention of separation of butyl p-hydroxybenzoate in soy sauce. Addendum. (Kagawa Prefect. Ferment. Food Exp. Stn., Uchinomi, Japan). Kagawa-Ken Hakko Shokuhin Shikenjo Hokoku 1972, (64), 18-24 (Japan).

A 0.5 ml portion of a com. prepn. contg. propylene glycol 60, licorice ext. 35, and glyceride 5% added to 500 ml soy sauce composed of the same vol. of brewed and acid-hydrolyzed soy sauce and contg. 83.3 ppm Bu p-hydroxybenzoate (I) prevented pptn. of I, an antifungal agent.

CA, V. 80, 1974: 36005w

TAKEUCHI, H.

Determination of benzoic acid in shoyu (soy sauce) by gas chromatography. (Shoda Shoyu Co., Tatebayashi, Japan). Chomi Kagaku 1969, 16(6), 1-4 (Japan).

Ext. 50 ml soy sauce with Et_2O for 17 hr or more. Ext. 3 times with 20 ml 0.1N NaOH, add concd. H_2SO_4 to pH 2, ext. 3 times with 20 ml Et_2O, dehydrate with Na_2SO_4, evap. Et_2O, dry in a desiccator, and dissolve in 1-2 ml 1% Et nonanoate in EtOAc. Gas chromatog. was done under the following conditions: stationary phase 30% silicone DC-550, carrier gas He, flow rate 20 ml/min, and column temp. 190°. The retention time was 1 min for benzoic acid, and 2 min for Et nonanoate used as the std.

CA, V. 73, 1970: 43954p

TAKEUCHI, T.

Peptides in miso and soy sauce. IX. Properties of peptides having high- and low-molecular weights in soybean miso. (Food Res. Inst., Nagoya, Japan). Hakko Kogaku Zasshi 1972, 50(5), 321-30 (Japan).

The amino acid compn. and some properties of 2 peptide fractions with low and high mol. wts., which were obtained by mol. sieves from soybean miso, were studies. The peptide fraction of low mol. wt. (the G-P fraction) was obtained by gel filtration through Sephadex G-15. Constituents of the G-P fraction, which was further sepd. into 3 fractions by paper electrophoresis, showed the following compn.: acidic peptides 52.7, neutral peptides 33.1, and basic pepetides 13.2%, based on the percentage of N. By hydrolysis of the high mol. wt. fraction under mild conditions,

with 2.5% HCl at 100° for 2 hr, peptides of low mol. wt. appeared, but a significant increase of peptides having a high mol. wt. was obsd. on the chromatogram of the amino acid autoanalyzer. Thus, the peptide bound with sugar might be abundant in high mol. wt. peptide in soybean miso. The acidic amino acid content in the peptides increased with increases in the peptide length. The high mol. wt. fraction had a larger amt. of glutamic acid than the G-P fraction.
CA, V. 77, 1972: 33040f

TAKEUCHI, T.
Peptides in miso and soy-sauce. XII. Low-molecular weight peptide in soybean miso. (Food Res. Inst., Nagoya, Japan). Hakko Kogaku Zasshi 1974, 52(4), 256-67 (Eng).

A low mol. wt. peptide fraction sepd. from soybean paste, miso, contained 10 acidic, 6 neutral, and 3 basic peptides. Their concns., except for some particular peptides coupled with glutamic acid or aspartic acid, were generally low. Evidently, the proteolysis of soybean miso resulted in the liberation of large amts. of free amino acids and the accumulation of some particular peptides, such as glutamyl peptides and aspartyl peptides, which were resistant to the action of the peptidases of Aspergillus oryzae. The 2 most common peptides were glutamylglutamic acid and glutamylaspartic acid which were responsible for the brothy taste.
CA, V. 81, 1974: 48705h

TAKEUCHI, T.; KATO, H.; et al.
Peptides in miso and soy sauce. I. Change of the peptide content during the soybean processing in miso brewing. Hakko Kogaku Zasshi 1962, 40, 375-9.

As studied by the use of Dowex 50 ion exchange resin, natural and defatted soybeans contained, beside protein, 2-3% (against total N) tripeptides and 5-7% oligopeptides consisting of (av.) 3-10 amino acids. The soybean protein had decreased H O soly. and changed to a form sol. in 0.2% NaOH during defatting and changed into forms sol. in 0.2% NaOH or insol. in aq. media during steaming. The denaturation of protein in steaming was accompanied by increasing the peptide content 3%. The insol. protein was made sol. during koji making through degradation into amino acids and oligopeptides.
CA, V. 62, 1965: 5811^{e}

TAKEUCHI, T.; KATO, H.; et al.
Peptides in miso and soy sauce. II. Peptide composition of soy sauce. Hakko Kogaku Zasshi 1962, 40, 379-84

Some com. soy sauces made by different modes of manufg. were analyzed for the relative contents of amino acids, peptides, and protein. The nitrogenous components, esp. peptides, exerted great influence on the viscosity of soy sauce.
CA, V. 62, 1965: 5811^{f}

TAKEUCHI, T.; YOKOO, Y.
Peptides in miso and soy sauce. XI. Effect of koji addition on the proteolytic patterns of soybean miso manufactured with an enzyme preparation. (Food Res. Inst., Nagoya, Jpaan). Hakko Kogaku Zasshi 1974, 52(1), 58-61 (Japan).

A comparative anal. was performed for free and bound amino acids in 4 types of soybean miso manufd. by several different combinations of the proportions of the com. enzyme, Biosaime A, which was perpd. by the water extn. of wheat bran koji of Aspergillus oryzae, in koji (0-100%). No remarkable difference was obsd. in the content of sol. N and the total amt. of whole amino acids in the water sol. fractions for all 4 types of miso. The contents of formol-N, NH_3-N, and the total amt. of free amino acids, however, were increased by increasing the amt. of koji. The content of free glutamic acid and aspartic acid increased remarkably and glycine also increased slightly, with the supplement of some koji (30% equiv. by wt. of soybean) to the enzyme miso. Therefore, the pattern of free and bound amino acids in each type of enzyme miso supplemented by some koji were consistent with the whole koji type miso prepd. by the conventional method.
CA, V. 80, 1974: 81093j

TAKEUCHI, T.; YOSHIDA, M.; et al.
Peptides in miso and soy sauce. VI. Group separation of small peptides in Mame-miso and their properties. (Food Res. Inst., Nagoya, Japan). Hakko Kogaku Zasshi 1969, 47(8), 496-501 (Japan).

Characteristic properties of the lower mol. wt. peptides in Mame-miso were studied with respect to their amino acid constitution. After dialysis, the peptides which had passed through the column of Dowex 50 X-16 (H) were sepd. by adsorption of the Dowex 50 X-4 (H) ion exchanger. Lower mol. wt. peptides were fractionated into 4 groups with the Amberlite IR-4B, IRC-50 ion exchanger, and their distributive N percentages in the strongly acidic, weakly acidic, neutral and basic fractions were 18.1, 39.5, 33.0, and 8.2, resp. The molar contents of aspartic and glutamic acids were 72.9% in the strongly acidic, 61.5% in the weakly acidic, and 27.3% in both neutral and basic peptides. Acidic peptides in which approx. 60% of all the lower peptides are comprised contain aspartic and glutamic acids in one mol. of peptide. Peptides contg. either aspartic or glutamic acid are abundant in the neutral and basic lower mol. wt. peptides in Mame-miso.
CA, V. 73, 1970: 75843t

TAKEUCHI, T.; YOSHIDA, M.; et al.
Peptides in miso and soy sauce. VII. Effect of peptides on the quality of soy sauce. (Food Res. Inst., Nagoya, Japan). Hakko Kogaku Zasshi 1969, 47(8), 502-9 (Japan)

The smaller peptides in soy sauce showed a comparatively strong buffer action over a wide range of pH. Esp., this buffer action was greater within the range of pH 5.5-7.5 as compared with that of the free amino acids in soy sauce. The contribution of the smaller peptides to the viscosity of soy sauce was not large. On

the other hand, comparatively larger peptides showed much higher viscosity in soy sauce.
CA, V. 73, 1970: 75844u

TANAKA, T.; SAITO, N.; et al.
Sensory evaluation of soy sauce. XI. Relations between odor patterns and chemical factors. 2. (Cent. Res. Inst., Kikkoman Shoyu Co., Ltd., Noda, Japan). Hakko Kagaku Zasshi 1970, 48(1), 56-62 (Japan).

This paper deals with the relations between the chem. factors of soy sauce and the sensory tech. terms to be used for the odor patterns of soy sauce. This study aimed to det. the components which play important roles in the odor of soy sauce. Soy sauce contg. more alc. and ext. by a pure brewing or a good fermentation had more aroma. Soy sauce contg. more levulinic acid (i.e., amino acid soy sauce) had less aroma. Alc. yield in the soy sauce brewing seemed to be the most important factor in making a preferable odor. More alc. gives a more desirable odor. Soy sauce contg. more alc. had a more alc. odor. Soy sauce contg. more levulinic acid and a higher pH had more amino acid odor and soy sauce contg. more alc. had less amino acid odor. A neg. relation between NH_3-nitrogen content and the amino acid odor was recognized. Soy sauce contg. more titratable acid had more acidic odor. Soy sauce contg. a higher pH had a fouler odor.
CA, V. 72, 1970: 120203b

TANAKA, T.; SAITO, N.; et al.
Relation between chemical factors and preference of soy sauce. (Kikkoman Shoyu Co., Noda, Japan). Chomi Kagaku 1969, 16(3), 21-6 (Japan).

A review with 20 refs. Chem. factors contributed only 46.3% in explaining the preference of soy sauce by sensory tests. Taste and smell contributed highly.
CA, V. 73, 1970: 43941g

TANAKA, T.; SAITO, N.; et al.
Flavors and sensory evaluation of fermentation foods. (Cent. Res. Inst., Kikkoman Shoyu Co., Ltd., Noda, Japan). Hakko Kogaku Zasshi 1971, 49(1), 69-83 (Japan). A review.

Taking soy sauce as an example, patterns of quality by organoleptic properties, the correlation between flavor, taste, and chem. compn. and sensory evaluation by a linear recurrence model were described. 121 refs.
CA, V. 74, 1971: 123725a

TANAKA, S.; UEDA, R.
The inorganic components in soy sauce. I. The calcium and magnesium contents. (Osaka Univ.). Hakko Kogaku Zasshi 1958, 36, 251-7.

Detn. of Ca and Mg could satisfactorily be performed by Patton's method with ethylenediaminetetra-acetic acid (C.A. 50, 1273g).

After the detns. on a no. of com. fermented soy sauce and protein-hydrolyzate products, it was found that these inorg. components are derived mainly from defatted soybean, wheat, and NaCl used as the starting materials. The Ca content was 0.02-0.1% and Mg 0.02-0.14% on all samples. The protein-hydrolyzate products in general contained less Ca and Mg than did the fermented ones. It was concluded that these amts. of Ca and Mg had no significant influence on the taste and flavor of the products.
CA, V. 52, 1958: 17608d

TANAKA, S.; UEDA, R.
Inorganic components in soy sauce. II. The iron content. (Osaka Univ.). Hakko Kogaku Zasshi 1958, 36, 263-6; cf. C.A. 52, 17608d.

Fe in concn. more than 100 γ/ml. causes deterioration in color and flavor of soy sauce. Fe in soy sauce was detd. by the o-phenanthroline method. NaCl below 100 mg./ml. did not interfere in the detn. Soybean and wheat, the starting materials for soy sauce production, contained 100-200 γ/g. Fe; fresh soybean contained less than defatted soy-bean. Com. NaCl averaged 16 γ/g. Fe; tap water, 0.3 γ/g, Fe. The Fe contents in a no. of com. soy sauces were 30-170 γ/ml. The pale-colored soy sauce contained less Fe than the deep-colored one.
CA, V. 53, 1959: 7503b

TODANI, T.; OKADA, N.; et al.
Effects of food preservatives on foods boiled down in soy sauce. I. Influence of food constituents on the effectiveness of food preservatives. (Food Ind. Expt. Sta., Hiroshima, Japan). Nippon Shokuhin Kogyo Gakkaishi 1966, 13(4), 125-30 (Japan).

The effectiveness of Na benzoate, ascorbic acid, K sorbate, dehydroacetic acid, Na dehydroacetate, and butyl p-hydroxybenzoate were tested. The preservatives were effective at 0.05% for the preservation of food products contg. relatively high amts. of moisture. They were also effective for food products having an acid pH. The preservatives were effective only above 0.2% for food products contg. high amts. of proteins and lipids.
CA, V. 65, 1966: 15978e

UCHIDA, K.; MOGI, K.
Fatty acid composition of shoyu (soy sauce) oils and their relation to those of the raw materials. II. Fatty acids of the total lipids from soybean, defatted soybean, and wheat, the raw materials of shoyu brewing. (Cent. Res. Lab., Kikkoman Shoyu Co., Ltd., Noda, Japan). Chomi Kagaku 1971, 18(11), 472-7 (Japan).

The fatty acids contained in the raw materials, soybeans, soybean cake, and wheat were detd. by gas chromatog. The amt. of fatty acids in soybean cake was 50% of total lipids. The pattern of the fatty acids was different from that of soybeans, having a resemblance to that of the phospholipids of soybeans, with much palmitic acid and less oleic acid content. The fatty acids of wheat were a third of the total lipids. Their pattern was different

from that of soybeans with respect to the large amts. of stearic and palmitic acids and less linoleic acid. These fatty acids remained in soysauce without decompn. although their form of combination was changed during manufg.
CA, V. 80, 1974: 94355w

UDO, S.
Taste of soy. I. J. Agr. Chem. Soc. Japan 1931, 7, 322-7.

Ten l. of soy was evapd. in vacuum to a half vol. The insol. substance consists of 14% NaCl and 2.4% of the mixt. from which leucine and 2 phosphates were isolated. The filtrate was acidified with H_2SO_4 and extd. with ether. The ether-insol. soln. was neutralized with $Ba(OH)_2$ and filtered. The soln. was treated with alc. several times and the insol. matter sepd. in 90% alc. soln. The insol. matter was extd. with MeOH. Asparatic acid and glutamic acid were isolated from the ext. The ext. has a characteristic taste of soy. The quantities of glutamic acid and asparatic acid in various periods through the fermentation were estd. They were max. after 2 years. The sepn. method of dibasic amino acids by electrodialysis was applied.
CA, V. 25, 1931: 5717

UDO, S.
Taste of soy. II. Organic bases in soy. J. Agr. Chem. Soc. Japan 1931, 7, 852-8; cf. C.A. 25, 5717.

From the 90% alc. ext. of the evapd. soy adenine (picrate), arginine (picrate and hydrochloride), choline (Pt salt), lysine (picrate), betaine (hydrochloride) and $C_6H_9N_3$, found by U. Suzuki and K. Aso, were isolated. The 90% alc. insol. part was extd. with MeOH. From the ext. arginine (picrate) and lysine (picrate) were isolated and histidine seemed to exist. From the naphthal yellow ppt. of fresh soy putrescine and cadaverine were isolated as picrates.
CA, V. 26, 1932: 783

UEDA, R.; FUKUCHI, M.; et al.
High-molecular-weight constitutents in soy sauce. II. Chemical composition of glycoproteins and polysaccharides in soy sauce. (Fac. Eng., Osaka Univ., Suita, Japan). Hakko Kogaku Zasshi 1975, 53(6), 401-8 (Eng).

The chem. compn. of 8 glycoprotein and 2 polysaccharide fractions of raw soy sauce made from soybeans was detd. The hydrolyzate of fraction C-1, a mixt. of glycoproteins, contained 7 monosaccharides, 3 uronic acids, and serine, threonine, glutamic acid, aspartic acid and alanine as the main amino acids. Each glycoprotein fraction was mainly composed of carbohydrate contg. uronic acid. In the hydrolyzate of polysaccharide fractions, 7 monosaccharides and galacturonic acid were detected. The carbohydrate content of all the glycoprotein fractions, except fraction C-1-4, was cosiderably lower in soy sauce made from defatted soybeans than in soy sauce from soybeans, and most of the content was produced from 1 month after mash prepn. On the other hand, the content of

fraction C-1-4, as well as that of the polysaccharide fractions, was similar regardless of the kind of raw material and the fermn. period, when expressed on the basis of total N.
CA, V. 83, 1975: 77215v

UEDA, R.; NAGAI, S.; et al.
Organic acids in soysauce. I. Determination of the organic acids in soysauce. (Univ. Osaka). Hakko Kogaku Zasshi 1959, 37, 94-9.

Sepn. and detn. of org. acids in nonpasteurized soysauce and "amino-acids liquor" were achieved by ether extn. followed by partition chromatography with silica gel. Lactic and succinic acids were not satisfactorily sepd. by a single run, and repeated chromatography was needed. In the ether ext. were present lactyl-lactic acid and lactyl-lactyl-lactic acid, which had been formed by polymerization of lactic acid and which caused error in detg. pyruvic and acetic acids. The org. acids sepd. in this way and identified by paper chromatography from nonpasteurized soysauce were butyric, isobutyric, propionic, levulinic, acetic, pyruvic, formic, α-ketoglutaric, succinic, lactic, pyroglutamic, glycolic, malic, and citric acids and an unidentified acid. Amino-acid liquor also contained these acids but in different amts.

II. Composition of the organic acids in soysauce and amino-acid liquor. Ibid. 99-104.

A no. of com. products were analyzed for org.-acid compn. Soysauce contained lactic acid (80% of the total org. acid content) and AcOH (8%) followed by pyroglutamic and succinic acids; other org. acids were below 1%. Rapidly brewed soy sauces contained considerable amts. of pyruvic acid and showed considerable variation in general compn. The amino-acids liquor contained more levulinic acid than any other org. acids.
CA, V. 54, 1960: 6023i

UENO, T.; KURAMOCHI, T.
Semichemical soy sauce. I. Changes of general components in the course of manufacture. (Noda Soy Sauce Co., Chiba-ken). Nippon Nogei-kagaku Kaishi 1960, 34, 187-93.

Semichem. soy sauce is manufd. by partial hydrolysis of proteinaceous raw material (e.g. defatted soybeans) followed by fermentation together with koji prepd. from carbohydrate raw material by Aspergillus. The general components of the hydrolyzate of defatted soybeans (with 6-8% HCl) were measured. At the end of hydrolysis, the contents of reducing sugars and furfural were higher than those observed in chem. soy sauce (hydrolyzate with concd. HCl). After neutralizing at 80° the contents of amino N and reducing sugars and pH decreased gradually, color formation was remarkable, and furfural decreased remarkably. L-glutamic acid (I) content decreased approx. 10% by heating at 70° and pH 5.0 for 48 hrs. I was heated with 5% NaCl and 2-8% HCl up to 8 hrs. at the b.p.; I decreased little at neutrality and 6-8% HCl, but it decreased considerably with 1-2% HCl, owing to pyroglutamic acid formation. By heating the soln. of I in the presence of xylose, glucose, and furfural, the color formation (browning) and the decrease in I

content were very large in case of 5% NaCl soln.; these changes were not so large in case of HCl solns.
CA, V. 54, 1960: 23172g

UENO, T.; KURAMOCHI, T.
Semi-chemical soy sauce. VII. Volatile components produced by HCl by hydrolysis of defatted soybean. (Noda Soy Sauce Co., Ltd., Chiba, Japan). Nippon Nogei Kagaku Kaishi 1961, 35, 454-8; cf. CA 59, 9246f.

The amt. of HCl evapd. during hydrolysis at 101-2° for 7 hrs. was less than 0.3% of the total HCL. Carbonyl compds. evapd. during hydrolysis and neutralization were identified by chromatography on alumina and silicic acid, and by paper chromatography as 2,4-dinitrophenylhydrazones. Furfural, 5-methylfurfural, hydroxymethylfurfural, acetaldehyde, acrolein, pyruvic acid, phenylpyruvic acid, α-ketobutyric acid, diacetyl, and methylglyoxal were detected. Furfural accounted for 74-92% of the total 2,4-dinitrophenylhydrazones, and other compds. were produced only in very small amts. Large amts. of formic and acetic acid and small amts. of butyric (or isobutyric) and propionic acid were detected by silica gel chromatography.

VIII. Chromatographic identification and determination of organic acids. Takahiro, Ueno. Ibid. 458-64.

The identification and quant. detn. of ether-sol. org. acids in chem., naturally brewed, and semi-chem. soy sauces and its intermediates were performed with silica gel chromatography and paper chromatography. Formic 2.7-192.2, acetic 69.4-86.0, propionic 0.7-3.6, butyric (or isobutyric) 0.3-6.1, levulinic 14.2-446.5, pyruvic 1.3-5.7, lactic 1.3-277.5, succinic 1.6-30.2, α-ketoglutaric 2.8-11.0, pyroglutamic 6.3-14.7, glycolic and oxalic 1.7-10.6, malic 0.6-6.8, citric 0.4-57.3, vanilic 2.2-10.9, syringic 2.5-12.9, α-ketobutyric 5.4-15.3, protocatechuic 2.4-12.9 maleic 3.0-4.1, malonic 2.6-5.9, and aconitic acid 2.8-6.6 mg./100 ml. contg. 1% total N were identified. Vanillin, syringaldehyde, acrolein, and hydroquinone were also identified. In semi-chem, soy sauce, the amt. of levulinic acid was the greatest, with formic, acetic, and citric acids following. Lactic and succinic acids increased to about 3-fold and formic acid decreased to about half by fermentation. Most of the vanillic and syringic acids and a part of levulinic and α-ketobutyric acids existed as free acids. The compn of nonvolatile org. acids in chem. soy sauce was similar to that in semi-chem. soy sauce, but larger amts. of volatile acids were contained in the former. In naturally brewed soy sauce, lactic acid was greatest, with acetic and succinic acids following, but formic, levulinic, malic, and citric acids were present in very small amts.
CA, V. 60, 1964: 1040bcde

UENO, T.; NOBUHARA, A.
Semi-chemical soy sauce. II. Content of furfural and acetaldehyde. (Noda Soy Sauce Co., Ltd., Noda, Chiba Prefect.). Nippon Nogeikagaku Kaishi 1960, 34, 223-8; cf. CA 54, 23172g.

Carbonyl compds. were obtained from the acidic (non-neutralized), neutralized, and fermented solns. of dil. HCl hydrolyzate of defatted soybeans by extn. with Et_2O at pH 7.0, and were fractionated as 2,4-dinitrophenylhydrazones from alumina column with a mixt. of petr. ether and benzene, benzene, and a mixt. of benzene and EtOAc successively. Furfural, 5-methylfurfural, hydroxymethylfurfural, and AcH were identified by paper chromatography, m.p., ultraviolet and infrared absorption spectra, and elementary analysis. Furfural content in the acidic soln. was about 600 mg./l. and this was approx. 92% of total aldehydes. After neutralization at 80°, furfural content decreased to about 2 mg./l. and AcOH content became about 23 mg./l. and this was approx. 36% of total aldehydes. In the fermented soln. AcOH content increased to about 120 mg./l. and this was approx. 88% of total aldehydes, while furfural content remained 2.5 mg./l.

III. Isolation and identification of volatile carbonyl compounds. Ibid. 229-33.

By the steam distn. of 4 kg. neutralized cakes derived from 20 l. dil. HCl hydrolyzate of defatted soybeans volatile carbonyl compds. were isolated. From the distillate 3.6 g. 2,4-dinitrophenylhydrazone derivs. was obtained. Fractionation of 2.25 g. of derivs. of the 3.6 g. gave 2.2 g. monocarbonyl fraction, sol. in $CHCl_3$, and polycarbonyl fraction 0.05 g., insol. in $CHCl_3$. From the polycarbonyl fraction diacetyl was identified. The monocarbonyl fraction was fractionated further from a mixt. of 2 parts of silicic acid and 1 part of Celite 545 with 2-10% Et_2O in petr. ether. Isovaleraldehyde, AcH, phenylacetaldehyde, furfural, and 5-methylfurfural were identified.
CA, V. 58, 1963: 16128h

WANG, T.H.; NI, S.M.

Chemical studies on the manufacture of soybean sauce by the Kwantou process. J. Chem. Eng. China 1936, 3, 284-96.

The process of soybean sauce manuf. used in Kwantou district, Fukien province, Chine, uses soybeans as the sole raw material and carries out the fermentation at room temp. for not more than 3 months; a high-quality product is obtained. This process is now studied scientifically and includes analyses of the raw material, intermediate products and final products. In the prepn. of the koji, the chief changes in found to be the hydrolysis of proteins and carbohydrates brought about by molds. The washing and soaking of koji which is characteristic of this process results in the removal of mold mycelia, whose presence would give an unpleasant taste to the sauce. The loss of enzymes is replaced in a second fermentation. Fermentation is finally completed in wooden tanks by mixing the koji with common salt. Protein and carbohydrate decompn. continues to a much grater extent in this manner. Concn. of the raw soybean sauce is accompanied by chem. changes which will be of much interest for further study. The fat constituent in the soybean takes no important part in the manuf. of the sauce.
CA, V. 31, 1937: 172^1

WATANABE, Y.; TAZAKI, R.
Extraction of materials from soy sauce mash; effect of the starting pH. (Ajinomoto Co., Kawasaki, JApan). Chomi Kagaku 1966, 13 (4), 27-34 (Japan).

The efficiency of extn. of ingredients during soy sauce fermentation is related to the initial pH of the mash and the incubation temp. When the pH is > 9.5, more ammonia N, basic amino acids, and org. acids like formate, acetate, and lactate are liberated into the mash. The quality of the product is inferior to that incubated at neutral pH, probably because of imbalance of such ingredients as amino acids and org. acids. When the fermentation takes place at lower temps. (12°), the liberation of materials measured as total N is very high, and the amino acid compn. of the mash is nearly the same as those obtained by ordinary fermentation. The mash obtained is characterized by its low content of org. acids and less flavor.
CA, V. 70, 1969: 19000s

YAMADA, K.; GOAN, M.
Evaluation of soy sauce flavor by gas chromatography. I. Flavor component determination by head gas analysis. (Choshi Shoyu Co., Choshi, Japan). Chomi Kagaku 1969, 16(2), 1-5 (Japan).

In the first method, the column was 5% polyethylene glycol 300 on Celite 545 (40-60 mesh) at 30-50°, and the carrier gas was He. In the second method, the column was 5% dinonyl phthalate on Celite 545, with the other conditions being the same. The head gas components of finished soy sauce mash juice included EtOAc, EtOH, PrOH, iso-BuOH, BuOH, amyl alc., and isoamyl alc.
CA, V. 73, 1970: 43979a

YAMADA, K.; INO, M.
Evaluation of soy sauce flavor by gas chromatography. II. Flavor components produced by shoyu koji microflora. (Choshi Shoyu Co., Choshi, Japan). Chomi Kagaku 1969, 16(5), 15-20 (Japan).

Undesirable flavor components may be formed by soy sauce koji microflora. Gas chromatog. showed EtOH, diacetyl, amyl alc, acetoin, AcOH, propionic acid, isobutyric acid, butyric acid, and isovaleric acid as products of glucose metabolism by Bacillus subtilis, B. circulans, Micrococcus, Xanthomonas, Staphylococcus, Aspergillus, and Saccharomyces rouxii isolated in a factory soy sauce. Gas chromatog. showed the production of AcOH, isobutyric acid, and isovaleric acid from defatted soybean flakes by B. subtilis, B. pumilus, M. conglomeratus, M. rubens, and M. candidus. The metabolites also included NH_3 and EtOH.
CA, V. 73, 1970: 43980u

YAMADA, K.; KUMAI, K.; et al.
Organic acids in soy sauce. I. Changes in the amounts of lactic and acetic acids during the mash process. (Miyagi Miso-Shoyu Ind. Co., Sendai, Japan). Chomi Kagaku 1975, 22(2), 13-7 (Japan).

General compn., contents of lactic acid [50-21-5] and HOAc [64-19-7] and variation of halophilic lactic acid bacteria and yeasts of soy sauce prepd. by adding lactic acid bacteria and yeast sep. were examd. to det. the relation between mash quality and levels of the acids. The mash to which bacteria or yeast had been added had a remarkable amt. of lactic acid, suggesting the possibility of lactic acid prodn. by the yeast. The ratio of lactic and acetic acids may indicate the quality of mash.
CA, V. 83, 1975: 191476f

YAMADA, K.; KUMAI, K.; et al.
Judgement of soy sauce quality by gas chromatography. I. Measurement of organic acids by gas chromatography. (Miyagi Miso and Soy Ind. Coop., Sendai, Japan). Chomi Kagaku 1974, 21(10), 24-6 (Japan).

Org. acids in soy sauce were detd. by gas-liq. chromatog. (GLC). A sample (10 ml) was adjusted to pH 2.0 with 25% HCl and extd. with ether for 90 hr. The ext. was neutralized with 2N NH_4OH and concd. under reduced pressure. The conc. was passed through an Amberlite CG 120 column and eluted with 200 ml H_2O. The eluate was dried and derived to butyl esters by refluxing for 30 min at 130° with 2 ml n-BuOH, 2 g Na_2SO_4, and 0.2 ml H_2SO_4. The butyl esters were extd. 3 times by 5 ml n-hexane for GLC anal. Formic [64-18-6], acetic [64-19-7], lactic [50-21-5], levulinic [123-76-2], and succinic [110-15-6] acids were detd.
CA, V. 83, 1975: 176923f

YAMADA, K.; KUMAI, K.; et al.
Judgement of soy sauce quality by gas chromatography. II. Analysis of soy sauce quality by organic acid patterns. (Miyagi Miso and Soy Ind. Coop., Sendai, Japan). Chomi Kagaku 1974, 21(10), 27-30 (Japan).

Anal. of org. acids in soy sauce by gas-liq. chromatog. (GLC) was applied for the judgement of the evaluation of its quality. The org. acids in soy sauce were detd. by GLC as butyl esters as reported previously. Formic [64-18-6] and levulinic acids [123-76-2] contents were high in low quality soy sauce, whereas lactic acid [50-21-5] was high in high quality soy sauce. However, these GLC patterns were not always in good agreement with the sensory evaluation.
CA, V. 83, 1975: 176924g

YAMAMOTO, Y.
White precipitate formed in chemical soy sauce. (Kagawa Fermented Foods Expt. Sta., Uchinomi, Japan). Kagawaken Hakko Shokihin Shikenjo Hokoku 1962, 54, 33-8 (Japan).

The white ppt. formed in chem. soy sauce during processing contained moisture 58.4, ash 13.73, total N 2.54, and NaCl 1.31%. After drying, it contained ash 33.11, total N 5.89, NaCl 2.85, and water-insol. matter 25.32%. The water-insol. matter was assumed to be mainly Ca oxalate from the results of its soly. in various reagents, and oxalate and citrate were detected by paper chromato-

graphy of water-insol. matter dissolved in HCl. The amt. of the ppt. formed after neutralization of acid-hydrolyzed soybean meal increased, and the amts. of Ca and Mg in the neutralized soln. decreased as the final pH increased to > 5.0. As Ca contents differed among the samples of defatted soybean meals (0.15-0.28%) and kinds of salt (0.025-0.043%), these factors were assumed to influence ppt. formation to some extent. In order to minimize ppt. formation in the chem. soy sauce, acid-hydrolyzed soybean meal should be neutralized to pH > 5.0 and the ppt. formed should be eliminated as much as possible, and then the pH should be lowered to < 5.0.
CA, V. 65, 1966: 4547f

YAMAMOTO, Y.; YANAGIDA, F.; et al.
White soy sauce. III. Composition of the organic acids of white soy sauce. (Tokyo Univ. Agric., Tokyo, Japan). Nippon Shokuhin Kogyo Gakkai-Shi 1973, 20(3), 109-12 (Japan).

The org. acids of white soy sauce (haku-shoyu) were sepd. by partition chromatog. with silica gel after extn. with Et_2O. They were identified as butyric acid [107-92-6], HOAc, formic acid [64-18-6], α-ketoglutaric acid [328-50-7], succinic acid [110-15-6], lactic acid [50-21-5], maleic acid [110-16-7], malonic acid [141-82-2], pyroglutamic acid [98-79-3], oxalic acid [144-62-7], glycolic acid [79-14-1], malic acid [6915-15-7], and citric acid [77-92-9] together with benzoic acid added as a preservative, not only by elution pattern but also by steam distn. and paper chromatog. The white soy sauce contained on av. 51% lactic and 13% HOAc [64-19-7] of total acids. It contained less pyroglutamic acid than ordinary soy sauce. An inverse correlation was found between the amts. of HOAc and lactic acid in the 4 samples of white soy sauce.
CA, V. 84, 1976: 57531n

YAMAMOTO, Y.; YANAGIDA, F.;et al.
Heat treatment of white soy sauce. (Tokyo Univ. Agric., Tokyo, Japan). Nippon Shokuhin Kogyo Gakkai-Shi 1971, 18(7), 340-2 (Japan).

White soy sauce is pale-colored and contains more sugar and less amino acids than dark soy sauce. Thus, it is desirable to add ribotide seasoning (inosinic and guanylic acids). However, white soy sauce contains phosphatase. This paper describes the inactivation of this enzyme (catalyzing hydrolysis of ribotide seasoning) by heat treatment, which is not usually applied to keep the color of the product pale. The phosphatase was inactivated by heating at 80° for 10 min. This heat treatment did not give any undesirable change in color, chem. compn., or flavor, although it produced some ppt.
CA, V. 77, 1972: 33048q

YAMANISHI, T.; OBATA, Y.; et al.
Flavors of soy sauce. V. Syntheses of sulfur-containing compounds. (Hokkaido Univ., Sapporo). J. Agr. Chem. Soc. Japan 1952, 26, 125-8 (Japan); cf. C.A. 46, 11475e

Several S-contg. ketones and Me thio ethers, including the following new compds. were synthesized and their flavors were tested. $AcCO_2(CH_2)_3SMe$ b_{15} 115-20° (semicarbazone, micalike plates, m. 133°), had a flavor very closely resembling that of soy sauce. $AcCH_2CH_2CO_2(CH_2)_3SMe$, b_{15} 146-50° (semicarbazone, m. 95-6°), $AcCO_2CH_2CH_2SMe$, b_{18} 86°(semicarbazone, bright needles, m. 156°), and 2-$AcCH_2CH_2CO_2CH_2CH_2SMe$, b_{14} 105° (semicarbazone, fine needles, m. 110°), also had a soy-saucelike flavor. $MeSCH_2CH_2Ac$, b_{25} 105-10°, n-$C_8H_{17}SMe$, b_{20} 100°, and n-$C_{12}H_{25}SMe$, b_{11} 135°, had flavors like arrow-head, mushroom, and Hottuynia cordata, resp.

VI. Syntheses of mercaptals and mercaptoles. Tei Yamanishi, and Yataro Obata. Ibid. 1953, 27, 652-4.

The following mercaptals and mercaptoles were synthesized and their flavors are described: $MeCH(SMe)_2$ (I) b_{17} 49°, $MeCH_2CH(SMe)_2$ b_{11} 47-8°, and $Me_2CHCH_2CH(SMe)_2$ b_{12} 70-1°, salted greenslike odor: $MeCH(OH)CH_2CH(SMe)_2$ b_{14} 124°, and $MeCH{:}CHCH(SMe)_2$ b_{17} 138°, somewhat similar to soy-sauce flavor; 2-[bis(methylmercapto)methyl]-furan (II), b_{25} 131°, Worcester-saucelike flavor; $MeC(SMe)_2Et$ (III), b_{29} 84°, camphorlike aroma; $MeC(OH)(SMe)CO_2H$, mixed smell of I and III (the above 8 copmds. are new); $MeCH(SEt)_2$ b_{20} 74°, $Me_2CHCH_2CH(SEt)_2$ b_{15} 110-11°, similar to I; 2-[bis(ethylmercapto)-methyl]furan b_{17}, 135°, similar to II; $MeCH(SCH_2CH_2OH)_2$ b_{18} 63-5°, a flavor like Allium bakeri; $Me_2CHCH_2CH(SCH_2CH_2OH)_2$ b_{14} 83°, autolyzed-yeastlike flavor; 2-[bis(2-hydroxyethylmercapto)methyl]furan b_{17} 80-110°, $MeCH{:}C(SCH_2CO_2H)_2$ b. 104°, and $Me_2CHCH_2CH(SCH_2CO_2H)_2$ b_{14} 70-110°, offensive odor; S,S'-furfurylidenedi(thioglycolic acid), putrefied-picklelike odor.

VII. Syntheses of acetals and aldol condensation products. Ibid. 657-9.

The following compds. have been reported: 3-(2-furyl)-2-propenal, cinnamic-aldehydelike odor, b_{14} 135°, m. 55°; 1-(2-furyl)-1-buten-3-one, coumarinlike and flowery aroma; 1-(2-furyl)-3-methyl-1-penten-5-al, sweet smell of unrefined soy, b_{15} 128°; 2-butenal, somewhat similar to soy flavor, b. 104°; 3-methyl-4-isononenal, terpenelike flavor, b_{20} 145°; 3-methyl-4,6-octadienal, somewhat soylike flavor; 1-penten-3-one, stimulative grassy odor; 2-buten-1-one-1-carboxylix acid, old soylike flavor; 2-isohepten-1-one-1-carboxylic acid, somewhat soylike flavor; 5-methylmercapto-2-penten-1-one-1-carboxylic acid, stimulative mixed smell of mustard and soy; 7-methylmercapto-3-methyl-4-heptenal, strong smell of unrefined soy, b_{17} 120-2°; 1,1-diethoxy-3-methylmercaptopropane, somewhat soylike flavor; 1,1-dipentoxy-3-methylmercaptopropane, weak soylike flavor; 1,1-bis(3-methylmercaptopropoxy)isopentane, boiled soylike flavor.

VIII. Syntheses of methyl sulfides. Ibid. 660-1.

The methods of synthesis and the flavors of several Me sulfides, including 5 new compds., are described. Me_2S, b. 37°, flavor of laver; $Me(CH_2)_2CH{:}CHCH_2SMe$, b. 150°, garlic-like flavor, and $CH_2{:}CHCH_2SMe$, b. 45-7°, mixed smell of Eutrema wasabi and Allium bakeri; $PhCH(OH)CH_2SMe$, b_{15} 142-3°, similar to aroma of hyacinth;

$Ph(CH_2)_2SMe$, b_{17} 105°, acidic smell of A. bakeri; $MeSCH_2CO_2Et$, b_{13} 62°, cheeselike flavor; $MeS(CH_2)_3Cl$ b_{25} 70°, similar to the flavor of E. wasabi; $MeS(CH_2)_2Cl$, b_{30} 60°, mustardlike smell; 3-(methylthio)propyl 2-furoate, unpleasant odor (substances marked, new compds.)
CA, V. 49, 1955: 2300ed

YAMASHITA, I.; TARO, T.; et al.
Analysis of organic acids in foods. VI. Development of a new isolation method and gas chromatographic determination of organic acids in soysauce. (Nagano Shokuhin Kogyo Shikenjo, Japan). Nippon Nogei Kagaku Kaishi 1974, 48(3), 165-70 (Japan).

The efficiency in extn. of org. acids from soy sauce by a new method was compared with that of the continuous (90 hr) extn. (Yamamoto, T., et al., 1973) and with that of repeated extn. by use of a Mojonnier tube. The new method involved the following procedure: pour 200 ml of Et_2O over a mixt. of 20 g of anhyd. Na_2SO_4 and 20 g celite in a 500 ml. beaker, add to it 10 ml of soy sauce (pH 1-2) dropwise under const. stirring, decant the Et_2O ext. after 10 min further stirring, wash the residue with fresh Et_2O, convert acids in the combined ext. to NH_4 salts, and remove the solvent and an excess of NH_3 at 30 and 50°, resp. The free acids liberated by treating with an ion exchange resin were converted to the Na salts and then esterified with BuOH. Although the continuous extn. method gave the best yield of volatile acids, it was time consuming. The use of a Mojonnier tube gave low yields owing to the formation of an emulsion at times. The new method, on the other hand, was rapid and gave relatively high yields when compared with the continuous extn. method: HCO_2H 111, AcOH 96, lactic acid 91, glycolic acid 60, oxalic acid 94, levulinic acid 92, benzoic acid 96, succinic acid 90, malic acid 98, pyroglutamic acid 59, and citric acid 66%
CA, V. 82, 1975: 2708d

YOKOTA, S.; FUJIMOTO, S.
Recovery of L-tyrosine in the process of manufacturing soy sauce from protein hydrolyzate. (Univ. Kamamoto, Japan). Nippon Jozo Kyokai Zasshi 1962, 57(1), 65-8.

L-Tyrosine (I) was obtained from solid waste which adheres inside the vessel and chokes filterpress and pipes manufacturing soy sauce by acid hydrolysis of defatted soybeans. Solid waste (dry matter 50 g.) was dissolved in dild. HCl, filtered, and the soln. neutralized to ppt. crude I (25.7 g., purity 45%), which was purified by dissolving in HCl, decolorized with active C, and pptd. by neutralization. The ppt. was then dissolved in dild. NaOH, filtered, and the soln. acidified with excess HCl, treated with C, and neutralized to obtain purified I (7.7 g.); recovery 67%. By controlling temp. of the hydrolyzate throughout the whole process to minimize the loss of I in the form of solid waste, the I was crystd. in a special vessel and collected. About 50% of I, which had hitherto been lost as solid waste, was recovered without changing the quality of the sauce.
CA, V. 61, 1964: 6278b

YOKOTSUKA, T.

Flavorous substances in soy. I. Isolation of flavorous substances from soy cake; chiefly the flavorous substances of lower boiling points. J. Agr. Chem. Soc. Japan, 1949, 23, 200-5 (Pub. 1950) (English summary).

Soy (Japanese soy sauce) was manufd. from soybeans 2268 kg., wheat 2268 kg., NaCl 1850 kg., and water 6.06 kl. After 1 yr. the mixt. was filtered under relatively low pressure, and 350 kg. of soy cake was obtained from 1400 kg. of soy mash. The soy cake (moisture nearly 30%) was crushed and promptly treated for the isolation of flavors. The method of solvent extn. was not successful. There were rather sweet flavors sol. in C_6H_6, $CHCl_3$, petr. ether, and Et_2O; rather acrid flavors sol. in H_2O, very dil. H_2SO_4 (pH 3), EtOH, and Me_2CO; and mercaptanlike flavor sol. in CS_2. By means of steam distn. about 30 fractions were sepd. From the distillate of lower b.p. 2 strongly flavorous yellow liquids, $C_9H_{18}O_2$ (b_{120} 33°) and $C_6H_{14}O_4$(b.72-72.5°), were obtained. The former is very diffusible and resembles the flavor in unheated soy. Besides them, AcH, propionaldehyde, butyraldehyde, valeraldehyde, and an unidentified S compd. (b. under 30°) were isolated. Among the fractions of higher b.p., several strong flavors were noted between b_{22} 50° and b_4 100°. The least-volatile flavors were recovered by means of adsorption with activated C. By this method other very good flavors most resembling the flavor in soy were obtained.
CA, V. 44, 1950: 5034h

YOKOTSUKA, T.

Flavoring substances in soy sauce. VI. Flavors with higher boiling points. 1. Ethyl palmitate and ethyl linoleate. (Noda Ind. Sci. Research Inst., Chiba) J. Agr. Chem. Soc. Japan 1951-52, 25, 206-10; cf. C.A. 44, 5034h.

Higher-boiling fractions of steam distillate of soy-sauce cake were further fractionated by distn. Judging from their b.p., m.p., d., n, mol. wt., elementary analysis, hydrolysis, EtO content, neutralization no., mol. refraction, and decompn. products on oxidation with $KMnO_4$ or $K_2Cr_2O_7$ fraction R, b_4 163°, was almost pure Et palmitate, and the fraction S, b4 183°, contained Et linoleate with a little Et oleate and Et palmitate.

VII. Flavors with higher boiling points. 2. Amyl alcohol and amyl acetate. Ibid. 401-3.

Fraction L, b_{68} 29-30°, consisted largely of EtOH, 12% isovaleraldehyde, and 3% amyl acetate. Fraction M, b_{22} 48-50°, contained a small amt. of hydroxymethylfurfural; redistn. revealed that M contained AmOH (probably chiefly Am rather than iso-Am alc.) and AmOAc in the ration of 3:1.

VIII. Flavors with higher boiling points. 3. Benzaldehyde and ethyl benzoate. Ibid. 446-50.

Fraction N, b_{16-22} 67-71°, contained benzaldehyde, Et benzoate, and a little Et isovalerate (or Et caproate). These were presumed

to be responsible for the relative fungistatic properties of brewed and heated soy sauce. These compds. may have arisen by β-oxidation of phenylalanine.
CA, V. 47, 1953: 7695a

YOKOTSUKA, T.

Flavoring substances in soy sauce. IX. Flavors with higher boiling points. 4. Isolation of phenolic flavoring substances. (Noda Ind. Sci. Lab., Chiba-ken). J. Agr. Chem. Soc. Japan 1953, 27, 276-81; cf. C.A. 47, 12227c.

1-Hydroxy-2-methoxy-4-ethylbenzene (I) was isolated and identified as its phenylurethan (II) from fraction O, b_4 75°, obtained from the higher boiling part of the steam distillate of soy-sauce cake. Fraction O (0.3 g.) was washed with 10 cc. 10% NaOH, acidified with H_2SO_4, and extd. with Et_2O, and the ext. was washed with aq. $NaHCO_3$ to give 0.05 g. I after evapn. I (0.05 g.) heated 10 min. at 150-180° with 0.08 g. phenylisocyanate gave 21 mg. II, needles, m. 104°, after allowing to stand 2 days, washing with cold C_6H_6, and treating with MeOH and C. Synthesis of I: guaiacol was acetylated in pyridine to give acetylguaiacol, which was converted to acetovanillone, m. 115° and b. 295-300°, by the Fries rearrangement with $AlCl_3$ and CS_2; acetovanillone with Zn amalgam and HCl gave I. A nearly theoretical yield of II was obtained from synthesized I with $CONC_6H_5$. I was found to be one of the most important components of soy-sauce flavor. I inhibited the growth of Zygosaccharomyces sulsus at 1/2500 concn. The synthetic and isolated samples of I showed the same R_f on paper chromatogram: 0.77-0.79 with petr. ether (b. 70-90°)-EtOH-H_2O (10:7:0.5) and 0.91 with BuOH-H_2O-EtOH-NH_4OH (10:2:0.5:0.5), the indicators being 10% $Fe_2(SO_4)_3$ and 0.5% Na ferricyanide. Fraction O contained 3-(methylthio)propyl alc. ($HgCl_2$ double salt, m. 128-30°) and some other CO compds. contg. S.

X. Flavors with higher boiling points. 5. Precursors of phenolic flavoring substances. Ibid. 334-9.

Acetic, benzoic, and vanillic acids, Et vanillate, I, isovaleric and caproic acids, acetovanillone (uncertain), isoacetovanillone (uncertain), and 2 other unidentified phenolic substances were obtained as hydrolysis products of higher-boiling fractions of steam distillate of soy-sauce cake. Of these substances, the former 5 compds. were obtained by weak hydrolysis. The flavoring substances seemed to occur as the esters and phenol esters. From the hydrolyzate, a cryst. compd., $C_{28}H_{56}O$, m. 126.5-127°, was obtained, which gave pos. Tschugajeff, Salkowski, and other steroid reactions, but had little effect on the flavors of soy sauce.

XI. Flavors of lower-boiling points. 2. Ibid. 359-63.

A S compd., which escaped in gas form during steam distn., $(C_4H_6S)_n$ or $(C_6H_{14}S_2)_n$, was isolated and presumed to be isobutyraldehyde dimethylmercaptal by color reactions, decompn. point of its Hg salt (about 170°), and flavor. From the distillate of lower b.p. than 75°, an Et-, Pr-, or allyl-mercaptan-like compd.

was obtained. Besides AcH and propionaldehyde, n- and isobutyraldehydes and isovaleraldehyde were identified. Mercaptals of these aldehydes seemed to play an important role in the flavors of cooked soy sauce.

XII. Flavoring substances in raw soy sauce. 1. Ibid. 549-53.

Flavoring substances were extd. with Et_2O from raw soy sauce and sepd. by chromatography on Al_2O_3 by developing successively with Et_2O, Et_2O-EtOH (1:1), 1% H_2SO_4, and 1% NaOH into 15 fractions. I, p-hydroxyphenylethyl alc., acetic, palmitic, and benzoic acids were obtained as the hydrolytic products of the fraction, whose flavors were strongest of all the fractions. Since these decompn. products had more intense flavor than the original ones, the flavors of cooled soy sauce were produced by hydrolysis of the esters of these acids and phenols. Vanillic acid was isolated from another fraction of weak flavor but of the strongest fluorescence. 1-Benzoyloxy-2-methoxy-4-ethylbenzene, m. 58-9°, was also sepd. from the intensely flavor-contg. fraction. Besides these compds., $C_8H_6O_3$, m. 250-60° (decompn.), and $C_{10}H_{20}O$, m. 320° (decompn.), were isolated, but their roles in the soy-sauce flavors were not yet clear.
CA, V. 49, 1955: 15163e

YOKOTSUKA, T.
Flavoring substances in soy sauce. XIII. The fungistatic substances in brewed soy sauce and the increase of the fungistatic nature by heating the soy sauce. J. Agr. Chem. Soc. Japan 1954, 28, 114-8; cf. preceding abstr.

The min. effective concn. of flavoring substances found in soy sauce to prevent the growth of harmful yeasts consisting mainly of Zygosaccharomyces japonicus and Z. sulsus was 0.01% for iso-Bu benzoate (probably present, marked(?) in the following): 0.02% for I, caproic acid, and iso-Bu vanillate (?); 0.04% for Et benzoate, Et vanillate, iso-Am acetate, and Pr benzoate (?); 0.06% for BzOH, BzH, Et isovalerate, and benzacetal (?); 0.1% for isovaleraldehyde, isovaleracetal, vanillic acid, and vanillin (?); and 0.1% for 1-benzoyloxy-2-methoxy-4-ethylbenzene, tyrosol, AcOH, propionic acid, isobutyric acid, isovaleric acid, EtOAc, Et lactate, Et palmitate, Et Oleate, Et mercaptan, iso-Am alc., BuOH, and isobutyracetal (?). The compds. responsible for fungistatic nature of raw and heated soy sauce were present in the acidic portion. Evident increase of phenolic substances was observed in heated soy sauce, and this was the reason why the heated soy sauce showed higher resistance to the harmful yeasts than the raw soy sauce. Paper chromatography showed the presence in the soy sauce of oxalic, succinic, lactic, acetic, propionic, isobutyric, benzoic, isovaleric, and caproic acids, I, tyrosol, Et vanillate, vanillin (uncertain), an unidentified phenol, vanillic acid, and an unidentified phenolic acid as acidic substances. AcOH, I, and an unidentified phenol (possibly vanillin) evidently increased by heating the soy sauce.
CA, V. 49, 1955: 15164b

YOKOTSUKA, T.

Flavoring substances in soy sauce. XV. In heated soy sauce. 2. (Noda Inst. Sci. Research, Chiba-ken). Nippon Nogei Kagaku Kaishi 1958, 32, 23-6; cf. C.A. 51, 9079g.

Countercurrent distribution and paper chromatography were applied to sepn. of flavoring substances in the weakly acid part of heated soy sauce. The sepn. was more difficult than in the case of raw soy sauce. The substances not yet reported included, in increasing order of transfer no., an unknown compd. with very low R_f, needles with fruit flavor with a little lower R_f than vanillic acid (which turned red with $FeCl_3$ and purple with $Fe_2(SO_4)_3$), distillate contg. SH which was easily adsorbed on Al_2O_3, oily distillate contg. S, a compd., $C_5H_6O_3$, m. 126-8°, needles, very unstable and easy to sublimate, needles, m. about 110° with R_f lower than tyrosol, and a flavoring distillate contg. a compd. which gave much 2,3-butylene glycol deriv., m. 198°, with phenylisocyanate, and an unknown urethan, m. 162°.

XVI. In raw soy sauce. 2. Yasuo Asao and Tamotsu, Yokotsuka. Ibid. 617-22.

Countercurrent distribution was applied to the study of acid fractions of raw soy sauce. Several lower fatty acids, as reported previously, were recognized by paper chromatography. Oxalic, benzoic, vanillic, and syringic acids were identified by m.p. paper chromatography, and infrared spectroscopy. Syringic acid was the first syringyl compd. isolated from soy sauce. Ferulic acid was also identified by paper chromatography. Discussion was made on the occurrence of various phenolic compds. in soy sauce.

XVII. Guaiacyl components in soy sauce. 1. Ibid. 622-8.

As the raw material, wheat was more important than soybean, in relation to the occurrence of guaiacyl ingredients in fermented soy sauce. Ferulic acid was identified for the first time as one of the guaiacyl compds. in soy sauce, and its important role in the course of fermentation of soy sauce was suggested. Vanillin and ferulic acid were identified after the cooking of wheat bran; the content of total free phenolic compds. of the material reached a max. after 24 hrs. of culture, and both the vanillin and ferulic acid changed to vanillic acid. Besides glycosides, lignin was considered to be the precursor of these phenolic compds.

CA, V. 54, 1960; 10231b

YOKOTSUKA T.

Aroma and flavor of Japanese soy sauce. Adv. Fd. Res. 1960, 10, 75-134 (Eng.)

This review covers chemical composition, chemical components of flavor, sources of aroma and flavor development, flavor ingredients as natural preservatives and microbiology of Japanese soy sauce. Over 90% of Japanese soy sauce is of the koikuchi type

with equal amounts of fermented sauce and chemical hydrolyzate obtained from defatted soybeans. 17 amino acids are present, chiefly glutamic acid. Glucose, galactose, maltose, arabinose and xylose are the sugars present. It is discussed whether the specific aroma of soy sauce is due to sulfur-containing volatiles or occurs in the acid fraction of volatiles. Mercaptals, and members of the guaiacyl and syringal series of phenolic compounds having an aroma similar to soysauce are mentioned. Besides Asp. oryzae or Asp. soyae, Monilia, Penicillium and Rhizopus are sometimes found in the mash (koji - wheat bran + soybean flour + mold - and saline water). However these molds are believed to have no role in proper aging. A number of yeasts are present in mash and also some bacteria.
Author

YOKOTSUKA, T.; ASAO, Y.; et al.
Flavor fortification of soy sauce or miso. Kikkoman Shoyu Co., Ltd. Japan. 21,753('67) (Cl. 36 D 14), Oct. 26, Appl. May 19, 1964; 3 pp.; cf. following abstrs.

A Torulopsis strain which produces 4,2-Et(MeO)C_6H_3OH (I) from ferulic acid is selected from T. versatilis, T. anomala, T. etchellsii, T. magnoliae, T. nodaensis, T. halophila, T. sphaerica, and T. sake by culture at 30° for 2 weeks on a medium (NaCl content 18%, pH 5.0 with lactic acid) of soy sauce koji ext. Brewing of soy sauce or miso in the presence of the selected strain with or without Saccharomyces rouxii to a I content of 0.1-10 ppm. gives a product of enhanced flavor. Thus, a selected strain of T. versalitis was cultured at 30° for 24 hrs. with aeration on a medium (pH 5) contg. raw soy sauce 25, NaCl 15, glucose 2, KH_2PO_4 0.1, $MgSO_4.7H_2O$ 0.0.5, $CaCl_2.2H_2O$ 0.01 and yeast ext. 0.1% and the preculture added during the brewing of soy sauce.
CA, V. 68, 1968: 28640m

YOKOTSUKA, T.; ASAO, Y.; et al.
Flavor fortification of soy sauce or miso. Kikkoman Shoyu Co., Ltd. Japan. 21,736('67) (Cl.36 D 14), Oct. 26, Appl. May 28, 1964; 3 pp.; cf. preceding and following abstrs.

A ferulic acid-contg. substrate is fermented with a selected Torulopsis strain to give a flavor liquor contg. 4,2-Et(MeO)C_6H_3OH (I), which is added during or after brewing to fortify the flavor. Thus, 20 l. wheat koji mash contg. 14% reducing sugar and 10% NaCl was fermented at 30° for 19 days with 5% of a preculture of T. versatilis to give a flavor liquor contg. 33.6 γ I/ml. Ordinary soy sauce was blended with 5% of the liquor.
CA, V. 68, 1968: 28641n

YOKOTSUKA, T.; ASAO, Y.; et al.
Flavoring substances in shoyu. XXVII. Production of 4-ethylguaiacol during the shoyu fermentation and its role for shoyu flavor. (Kikkoman Shoyu Co., Ltd., Noda, Japan). Nippon Nogei Kagaku Kaishi 1967, 41(9), 442-7 (Japan).

Torulopsis versalitis was a superior strain for production of 4-ethylguaiacol, an important flavoring ingredient of shoyu. Saccharomyces rouxii did not form 4-ethylguaiacol. The balance of growth of T. versatilis and S. rouxii in fermenting shoyu mash seemed to control the flavor of shoyu. Com. high quality shoyu contained 0.5-2.0 ppm. of 4-ethylguaiacol. The addn. of 1-3 ppm. of 4-ethylguaiacol to shoyu contg. no 4-ethylguaiacol improved the quality of the shoyu.
CA, V. 68, 1968: 86266e

YOKOTSUKA, T.; SAKASAI, T.; et al.
Flavoring substances in shoyu (fermented soy sauce). XXV. Flavoring components produced by yeast fermentation. 1. (Kikkoman Shoyu Co., Ltd., Noda, Japan). Nippon Nogei Kagaku Kaishi 1967, 41(9), 428-33 (Japan).

About 300 strains of yeast were isolated from shoyu mash which had good flavor. From these yeasts, 13 yeasts were selected as to the alc. fermentation rate in shoyu-koji autolyzate supplemented with 5% glucose and 18% NaCl. The selected yeasts produced HOAc and lactic acids as acid components. EtOAc, EtOH, iso-BuOH, and iso-AmOH were detected by gas chromatog. and tyrosol and 4-ethylguaiacol were revealed by thin-layer chromatog. The use of these yeast for the brewing of soy sauce improved the flavor of the shoyu produced.
CA, V. 68, 1968: 86264c

YOKOTSUKA, T.; SHIGEKI, M.
Aromatization of soy sauce, sake, etc. (to Noda Industrial Science Research Institute, Inc.). Japan. 6444('51), Oct. 17.

Soy sauce or sake with insufficient aroma is blended with 0.03-0.04% of a mixt. of 80% $Me_2CHCH_2COCH(OEt)_2$ and 20% $Me_2CHCH_2COCO_2Et$. In Japan. 6445('51), about 0.03% $Me_2CHCH_2CHOHCH(OEt)_2$ is added to the mixt.
CA, V. 47, 1953: 3518c

YOKOTSUKA, T.; SUMIKI, Y.
Addition of flavoring substance to soy sauce. (to Noda Industrial Science Research Institute, Inc.). Japan. 1541('54), Mar. 23.

The raw material for fermentation of soy sauce is treated with 0.0001-0.01% 4,2,1-Me(or Et)MeO(or EtO)C_6H_3OH. In Japan. 1542('54), 0.0001-0.01% 4,2,1-Me(or Et)MeO(or EtO)C_6H_3OR (R = Ac or Bz) is added.
CA, V. 49, 1955: P : 1240f

YOKOTSUKA, T.; TAKIMOTO, K.
Flavoring substances in soy sauce. XIV. Flavoring substances in heated soy sauce. 1. (Noda Ind. Sci. Lab., Chiba-ken). Nippon Nogei-kagaku Kaishi 1956, 30, 66-71; cf. C.A. 49, 15164a.

Raw brewed soy sauce was heated at 80° for 35 hrs., and the samples were analyzed at 5-hr. intervals. Total titratable acidic substances, N-contg. acidic substances sol. in Et_2O, both in the free and combined forms, Et_2O-sol. acids in the free form,

phenolic substances in the combined form, and the extinction values at 470, 530, and 610 mμ (red, yellow, and blue) total N did not change; amino N and reducing sugar decreased. The max. ultraviolet absorption of the phenolic fraction of the Et_2O ext. shifted from 265 to 280 mμ on heating; the intensity increased and then decreased on prolonged heating. This is discussed in relation to 1-hydroxy-2-methoxy-4-ethylbenzene (C.A. 49, 15163c). The acidic fraction showed max. absorption at 265 mμ, presumably corresponding to vanillic acid. The neutral fraction showed max. absorption at 290 mμ, seemingly corresponding to furan components, the presence of which, however, could not be indicated by color reactions. The degree of heating of soy sauce might be judged by the above changes of some constituents.
CA, V. 51, 1957: 9079g

YOSHIDA, M.; TAKEUCHI, T.; et al.
White soy sauce. V. Dregs in commercial soy sauce. (Food Res. Inst., Nagoya, Japan). Nippon Shokuhin Kogyo Gakkai-Shi 1970, 17 (2), 60-4 (Japan).

The compn. of the dregs found in com. white soy sauce was investigated to obtain the following result. The dregs sepd. by filtration and washed with H_2O consisted of ~ 86% amino acids and 12% sugars. These amino acids were composed of 96% tyrosine and 4% phenylalanine. After hydrolysis of the dregs, mannose and fructose were detected on thin-layer chromatog. Since the sugars could be sepd. from the amino acids on paper electrophoresis, it is probable that these amino acids and sugars do not exist in combined form.
CA, V. 73, 1970: 97576k

YOSHIDA, M.; TAKEUCHI, T.; et al.
White soy sauce. VI. Changes of tyrosine and phenylalanine during white soy sauce making. (Food Res. Inst., Nagoya, Japan). Nippon Shokuhin Kogyo Gakkai-Shi 1970, 17(2), 65-8 (Japan).

Changes of the amt. of tyrosine (I) and phenylalanine (II) were investigated during the process of white soy sauce making. On the process of koji making, formol N increased only in the early stage within 24 hr, whereas the amt. of (I) and (II) increased linearly throughout the whole process. Within 2 weeks of fermentation (I) content increased rapidly and then continued to increase gradually, whereas (II) content reached to the max. after 3 weeks. Final contents of (I) and (II) were 86 mg/100 ml and 110 mg/ml, resp.
CA, V. 73, 1970: 97577m

YOSHINO, H.
Studies on soy sauce by paper partition chromatography. I. Sugars and amino acids in the cooking juice of soybeans. (Yamasa Shoyu Co., Chiba-ken). Nippon Jozo Kyokai Zasshi (J. Soc. Brewing, Japan) 1951, 46, K. 7-13.

The descending method with phenol (with 10% of 0.1% aq. NH_3), collidine, or $BuOH-AcOH-H_2O$ (4:1:1) as the solvent and aniline acid phthalate, benzidine reagent, or resorcinol reagent as the coloring reagent showed the existence of glucose and sucrose in the alc. ext. of the defatted soybean meal and the existence of fructose, glucose, sucrose, and stachyose in the aq. ext. obtained by treating the residue from alc. extn. with H_2O at 40-50°. The juice obtained by cooking defatted soybean meal under 10 lb. pressure contained fructose, galactose, glucose, sucrose, manninotriose, and stachyose; the existence of arabinose and mannose was not evident. The amino acids were examd. with ninhydrin, K iodoplatinate, Pauly reagent, of Ehrlich reagent as the coloring reagent. The cooked juice contained as free amino acids glycine, alanine, glutamic acid, aspartic acid, tryosine, valine, arginine, lysine, methionine, phenylalanine, leucine (or isoleucine); the existence of cystine and tryptophan was not evident; histidine was absent.

II. Sugars in soy sauce. Ibid. 44-51.

The influences of NaCl, amino acids, EtOH, and org. acids on the detection of sugars were examd. With soy sauce (which contains about 18.5% NaCl) the effect of NaCl was the greatest; in general NaCl decreased R_f values of sugars. Ketose or ketose-contg. oligosaccharide could not be detected in soy sauce. Owing to the presence of MNaCl the detection of oligosaccharides was difficult. Soy sauce contained as monosaccharides glucose, galactose, arabinose, and xylose. Two-dimensional chromatography showed the nonexistence of mannose.

III. Free amino acids in soy sauce. Ibid. 52-4.

Amino acids with R_f values similar to NaCl were influenced by NaCl. The sepn. of amino acid fraction from inorg. compds. and sugars was carried out as follows: filter off the inorg. ppt. obtained by adding H_2SO_4 to soy sauce, ext. with Et_2O, remove SO_3 with $Ba(OH)_2$, conc. in vacuo, add 98% EtOH to 80% concn., filter, wash the residue with 80% EtOH, conc. in vacuo the filtrate and washing, add 10% Na_2CO_3 and 25% Hg acetate, add EtOH, ppt. amino acids as carboxyamino acid mercuric salts, decomp. with H_2S, and conc. in vacuo. Soy sauce contained glycine, alanine, valine, leucine (or isoleucine), arginine, histidine, lysine, phenylalanine, tyrosine, cystine, methionine, threonine, glutamic acid, aspartic acid, and proline.
CA, V. 46, 1952: 7282a

e. Other Influence in the Foodstuff

BANDO, H. and KINOSHITA, S.
Determination of anionic surfactants in soybean sauce. (Prefect. Public Health Lab., Tokushima, Japan). Shokuhin Eiseigaku Zasshi 1965, 6(4), 373-5 (Japan).

For detg. anionic surfactants added illegally to soybean sauce, a sample was washed with C_6H_6 to sep. fat which interferes with

the detn., and analyzed by the Longwell method (L. and Mahiece, CA 49, 7784g). Thus, pipet 1 ml. sample into a stoppered tube, add 9 ml. H_2O, acidity with N HOAc, and wash the sample soln. 3 times with 20-ml, aliquots of C_6H_6, centrifuging and removing the C_6H_6 layer each time. Neutralize the sample soln. with N NaOH, and add 10 ml. Na phosphate buffer soln. (dissolve 10 g. Na_2HPO_4 in H_2O, adjust the pH to 10, and dil. to one l.) and 5 ml. 0.035% neutral methylene blue soln. Allow to stand for 5 min., add 10 ml. $CHCl_3$, shake well, centrifuge, and remove the aq. layer. Wash the $CHCl_3$ layer twice with 1 ml. acidic methylene blue soln. (dissolve 0.35 g. methylene blue and 6.5 ml. H_2SO_4 in one l. H_2O) and 20 ml. H_2O. Det. the absorbance of the $CHCl_3$ layer at 650 mμ and calc. the amt. of the title compd. from the calibration curve. The method was used for Na lauryl sulfate and Na dodecyl benzenesulfonate added to soybean sauce in the range 5-40 ppm.
CA, V. 64, 1966: 1253c

FUJIKAWA, F.; NAKAJIMA, K.

Antiseptics for foods. XLVII. Antiseptic action of hydroxyalkylcoumarins for soysauce. (Kyoto Coll. Pharm., Japan). J. Pharm. Soc. Japan 1951, 71, 528-9; cf. C.A. 44, 5495b.

6,7-R(HO)C_6H_2CH:CH.CO.O, where R = Me, Et, Pr, Bu (I), Am, iso-Am, and 6,5-Me$(CH_2)_5$(Et)- C_6H_2CH:CH.CO.O were tested. I prevented the growth of mold during 50 days test at the concn. of 0.01% while the others were very weak at the concn. of 0.001-0.01%.
CA, V. 45, 1951: 8669e

HANAOKA, Y.

Preservation of soy sauce. V. The effects of butyl p-hydroxybenzoate and benzoic acid in several soy sauces on yeast and lactic acid bacteria. (Cent. Res. Inst., Kikkoman Shoyu Co. Ltd., Noda, Japan). Hakko Kogaku Zasshi 1967, 45(1), 22-8 (Japan).

The growth of lactic acid bacteria in soy sauce was controlled by the phys. action of osmotic pressure and pH in the soy sauce. Its max. osmotic pressure was between 85 and 112 atm. and max. pH was between 3.8 and 4.0. But when osmotic pressure in the soy sauce was equal, the growth of lactic acid bacteria was not related to the concn. of NaCl, KCl, and glucose in the soy sauce. The germicidal action of Bu p-hydroxybenzoate (I) in the soy sauce was more effective on the yeast than on the lactic acid bacteria. At the level of 5 X 10^5 viable cells/ml. the yeast and lactic acid bacteria were not completely killed but inhibited by the addn. of benzoic acid (II) 2 mg./ml. between pH 4.8 and 5.0 in the soy sauce. The effect of I on the yeast and lactic acid bacteria was activated by the addn. of NaCl in the soy sauce but decreased by the addn. of glucose. And the germicidal action of I on the yeast was more effective in the semichem. soy sauce than in the brewed soy sauce. The thermal death time of the yeast and lactic acid bacteria was increased by the addn. of NaCl, KCl, I, and II to

the soy sauce, but decreased by the addn. of glucose. II in the soy sauce was ~40% as effective as I.
CA, V. 69, 1968: 18094t

HANAOKA, Y.; YOKOTSUKA, T.
Preservation of soy sauce. VII. Benzoic acid in soy sauce and its mechanism of formation. (Cent. Res. Inst., Kikkoman Shoyu Co., Ltd., Noda, Japan). Hakko Kogaku Zasshi 1967, 45(9), 826-31 (Japan).

Naturally fermented soy sauce contains many kinds of aliphatic acids including trace amts. of benzoic acid (I). The content of I in soy sauce can be most accurately detd/ by gas chromatog. with a H flame ionization detector. The peak of I was identified referring to retention time of the peak of standard I and the amt. of I was calcd. from the ratio of peak height in gas chromatogram of I and acetanilide as the internal standard compd. By this procedure the amt. of I in raw soy sauce was ∿ 3 ppm. and after heating a 0.3-1.0 ppm. increase was observed. The occurrence of I in soy sauce was not derived from the metabolites of Aspergillus sojae, yeasts, and bacteria of fermentation, but from the I of raw materials, defatted soybean flour (I ~ 18 ppm.) and wheat (I ∿ 4 ppm).
CA, V. 69, 1968: 18095u

HASHIBA, H.
Browning compounds in shoyu (soy sauce). (Noda Inst. Sci. Res., Choshi, Japan). Nippon Nogei Kagaku Kaishi 1971, 45(1), 29-35 (Japan).

Soy sauce was fractionated into 3 peaks (PI, PII, and PIII) by gel filtration through Sephadex G-25. The absorbance of PI at 470 mμ was increased by oxidn. and that of PIII was increased by heating at 120° for 1 hr. PI, giving a black tint to soy sauce, was probably identical with soya melanin, and PIII, giving a red tone, contained C 50.1, H 5.2, N 11.9, and O 32.8%, was sol. in H_2O, MeOH, and EtOH, insol. in Me_2CO and Et_2O, and neg. to ninhydrin and Fehling reactions.
CA, V. 75, 1971: 34130f

HASHIMOTO, H.; IWAASA, T.; et al.
Studies on the sediment of shoyu (soy sauce). Comparison of shoyu and sake in the mechanism of formation of the protein turbidity caused by heating. (Cent. Res. Lab., Kikkoman Shoyu Co., Ltd., Noda, Japan). Hakko Kogaku Zasshi 1976, 54(1), 21-30 (Japan).

The action of proteases remaining in raw shoyu and sake on the formation of sediment of shoyu and of protein turbidity of sake was studied. Protein fractions contg. the precursors of sediment were isolated by gel filtration of the EtOH precipitate of raw shoyu on Sephadex G-50. The sediment was gradually formed as low mol. wt. peptides were released during heating of the protein soln. (15.2 mg protein/ml. pH 5.0) contg. 3M NaCl at 85° for 30 min and 60° for 3 days. These results indicate that the protease

remaining in raw shoyu actually acts on precursor proteins of sediment during the heating. The sediment (deposited during the heating of the protein isolated from raw shoyu) contained some addnl. hydrophobic amino acids compared with the native protein and the peptides released during the heating. These results support the indication given in a previous report that the formation of the sediment in shoyu could occur mainly through hydrophobic interactions among the denatured protein mols. modified by the protease actions. Turbidity appearing on heating raw sake was influenced by the temp. of heating; heating at around 50° caused sake to become most turbid, that is, turbidity of sake, like that of shoyu, did not increase with increasing temp. Protein turbidity of sake, as compared with shoyu, did not form flocculent sediment during settling after heating. Compared with raw shoyu, raw sake contained smaller amts. of proteases which may affect the appearance of sediment. Acid protease of raw sake which was the main protease remaining in raw sake, began to lose activity at 45° and was rapidly inactivated in the temp. range of 50-60° in sake contg. about 20% EtOH. The purified acid protease of Penicillium duponti K1014 was fairly stable during incubation at 50-60° in sake, compared with acid protease of raw sake. Addn. of 5 ppm of active purified acid protease caused raw sake to become turbid during heating at 55° for 30 min, and within 2 days flocculent sediment was formed during settling at 20°. However, the acid protease inactivated by diazoacetylnorleucine methyl ester did not affect the formation of the sediment. Based on these results it was suggested that proteases remaining in raw sake barely accelerate the formation of turbidity, but can not lead turbidity proteins to the coagulating form owing mainly to lack of both amt. and stability.
CA, V. 84, 1976: 103818m

HASHIMOTO, H.; YOKOTSUKA, T.
Sediment of shoyu (soy sauce). VI. Sediment-forming activity in fermented raw shoyu. (Cent. Res. Lab., Kikkoman Shoyu Co., Ltd., Noda, Japan). Hakko Kogaku Zasshi 1972, 50(4), 257-63 (Japan).

In the previous paper it was reported that the sediment formed during the heating of fermented raw shoyu was mainly composed of protein. In this paper, the factors that accelerate this sediment formation in raw shoyu were studied. The sediment-forming activity disappeared after treatment of the sample $<$ pH 3.0 or $>$ pH 9.8. The activity was the most stable at pH values ~ 5.8, where ~ 55% of the original activity remained after incubation at 40° for 20 hr. Inactivation of sediment formation began with incubation at 45° for 10 min; the activity was completely lost after heating at 75° for 10 min. However, activity was again obsd. after heating $>$ 80° for 10 min. The sediment-forming factors in raw shoyu were attributed to 3 components sepd. on a DEAE-cellulose column. These components had proteolytic activities. A similar pattern on a DEAE-

cellulose column was obsd. with koji ext. for shoyu. Addn. of purified alk. protease from Aspergillus sojae /Aspergillus parasiticus/ greatly decreased the time of sediment formation. These results strongly suggest that the sediment-forming activity in fermented raw shoyu is caused by certain proteases from A. parasiticus which still remain in the mash at the final stage of fermentation.
CA, V. 77, 1972: 18170e

HASHIMOTO, H.; YOKOTSUKA, T.
Sediment of soy. VIII. Mechanisms of sediment formation during heating of raw soy. (Cent. Res. Lab., Kikkoman Shoyu Co., Ltd., Noda, Japan). Hakko Kogaku Zasshi 1974, 52(2), 328-34 (Japan).

Proteases, especially a thermostable one, which originate soy koji mold and remain in raw soy sauce, may play an important role in sediment formation during the heating of fermented raw soy sauce.
CA, V. 81, 1974: 48737v

HASHIMOTO, H.; YOKOTSUKA, T.
Sediment of shoyu (soy sauce). IX. Role of hydrophobic bonds among protein molecules in sediment formation during heating of raw shoyu (soy sauce). (Cent. Res. Lab., Kikkoman Shoyu Co., Ltd., Noda, Japan). Hakko Kogaku Zasshi 1974, 52(10), 747-58 (Eng.).

Turbidity caused by proteinaceous sediment deposited during the heating of clear raw shoyu was little affected by addn. of NaCl up to 4.0M at pH values of 4.8, 6.0, and 7.0. However, addn. of NaCl accelerated aggregation of the sediment which was suspended in 0.01M acetate buffer (pH 4.8). Turbidity was little affected by mercaptoethanol and a variety of other reagents known to cleave SS bonds or by SH-blocking reagents. EDTA had no effect on sediment soly. Addn. of urea at > 1.20M decreased the turbidity, although it had no significant effect on sediment soly. at < 1.20M. Na dodecyl sulfate (SDS) greatly reduced turbidity and increased dissolved proteins; > 90% of the sediment proteins were dissolved at 2 X 10^{-3}M SDS. The amt. of SDS necessary for dissolving the sediment decreased with higher pH. Addn. of SDS prevented the sediment from appearing in the conc. of fermented raw shoyu during heating, whereas SS bond-splitting and SH-blocking reagents little affected sediment formation during the heating of raw shoyu, when the reagents were added just after heating at 85° for 30 min. A fluorescent dye, 1-anilino-8-naphthalenesulfonate (ANS), was used to examine the role of hydrophobic interactions among protein mols. in the formation of the sediment. The emission max. of ANS was ~ 520 nm in 1.0M acetate buffer soln.(pH 5.0), whereas the emission max. of the dye bound to the sediment shifted to ~ 465 nm, accompanied by a marked increase in fluorescence intensity. Addn. of NaCl to sediment suspension at 0.3 and 3.0M enhanced fluorescence, indicating that in shoyu contg. ~ 3M NaCl, sediment could form through hydrophobic interactions among protein mols. Protein contg. 3M NaCl isolated

from raw shoyu enchanced ANS fluorescence with increased efficiency after hydrophobic regions were exposed by thermal denaturation and possibly by protease action during heating. Formation of the sediment in shoyu could possibly occur mainly through hydrophobic interactions among the denatured protein mols.
CA, V. 82, 1975: 15500e

HASHIMOTO, H.; YOSHIDA, H.; et al.
Removal of iron from soy sauce. (Cent. Res. Inst., Kikkoman Shoyu Co., Ltd., Noda, Japan). Hakko Kogaku Zasshi 1970, 48(1), 50-5 (Japan).

Removal of Fe from shoyu (fermented soybeans and wheat sauce contg. a 1.0∼1.5% total N) and the form of Fe in shoyu were investigated. The Fe in shoyu derives, presumably, from its raw materials, and mainly from soybeans and wheat. Addn. of tannic acid or $K_4Fe(CN)_6$ was effective for the removal of Fe from both raw and heated shoyu. About 60-70% of the Fe in shoyu was easily removed by this procedure without affecting the organoleptic quality. When sufficient amts. of tannic acid and $K_4Fe(CN)_6$ were applied during the heating process, about 93% of the Fe was removed. Most of the Fe in raw and heated shoyu was observed to be in the form of Fe^{++}. The influence of Fe^{++} on the coloring of shoyu during storage was smaller than that of Fe^{++} and Cu^{++}. The rate of coloring during storage of shoyu contg. 7-10 γ Fe/ml, that was prepd. by the above procedures, was almost equal to that of the usual shoyu contg. 20-23 γ Fe/ml. The oxidative increase in color of shoyu contg. 2 γ Fe/ml, that was prepd. by the same method, was slightly lower than that of non-treated shoyu contg. 32 γ Fe/ml. The sediment produced during storage of shoyu was not decreased by this much removal of Fe. Probably this sedimentation was not caused by the metals such as Cu^{++}, Fe^{++}, and Fe^{3+}.
CA, V. 72, 1970: 120202a

HASHIMOTO, H.; YOSHIDA, H.; et al.
Sediment of shoyu [soy sauce]. I. Factors influencing the formation of secondary sediment of shoyu. (Cent. Res. Lab., Kikkoman Shoyu Co., Ltd., Chiba, Japan). Hakko Kogaku Zasshi 1970, 48(8), 493-500 (Japan).

Bottled shoyu in the market sometimes becomes turbid and soon a flocculent sediment is observed when it is kept at room temp. or higher and these turbidity and sediment extremely deteriorate the com. value of the product. This kind of sediment is defined here as secondary sediment of shoyu. The shoyu in the market is usually bottled after heating the filtrate of fermented shoyu mash or its mixt. with a chem. hydrolyzate of vegetable proteins, and then removing by filtration or sedimentation the sediment produced by heating. When raw shoyu was heated at 50° or higher, the secondary sediment appeared in the final product. The shoyu heat-processed at 70° had a much smaller secondary sediment than that heated at 60 or 80°. When heated and clarified shoyu was

kept over 30°C, the time required for the sediment formation was markedly shortened at elevated temps. Secondary sediment was hardly formed below 30°. The secondary sediment of shoyu formed more easily when the total N content was higher, but its formation was inversely proportional to the concentration of acid hydrolyzate of defatted soy beans or wheat gluten added to shoyu. A high concn. of NaCl inhibited the sepn. of the ppt. The sediment most easily formed when raw shoyu, pH 4.6-4.7, was heated, but in heat-processed shoyu, the time required for the sediment formation was shorter at a lower pH than at a higher pH. Fermented shoyu made from whole soy beans and wheat more easily formed the secondary sediment than that made from defatted soy beans and wheat.
CA, V. 73, 1970: 129658g

HASHIMOTO, H.; YOSHIDA, H.; et al.
Sediment of shoyu /soy sauce/. II. Effect of chelating agents and surfactants on the prevention of secondary sediment of shoyu. (Cent. Res. Lab., Kikkoman Shoyu Co., Ltd., Chiba, Japan). Hakko Kogaku Zasshi 1970, 48(8), 501-5 (Japan).

Chelating agents such as polyphosphate and hydroxycarbonic acid had little effect, but those such as EDTA, DTPA (diethylenediamine pentaacetate), HEDTA (hydroxyethylenediamine triacetate) completely inhibited the formation of secondary sediment of shoyu even with a final concn. as low as 0.1%. And these agents did not affect the organoleptic quality of the shoyu. But DEG (dihydroxethylglycine) and NTA (nitrilo triacetate) were not effective. The time required for the flocculation was prolonged a little by the addn. of surfactants such as Emanone 3199 and colloidal substances such as Duckroid PF159, LF122, but these agents affected the organoleptic quality. On the other hand, the time required for the flocculation in com. types of shoyu was measured at 40°. The results suggested that the secondary sediment would be seen in a considerably large no. of com. types of shoyu in market after a long period of storage at a comparatively high temp.
CA, V. 73, 1970: 129657f

HASHIMOTO, H.; YOSHIDA, H.; et al.
Sediment of shoyu. III. Effect of adsorbents and precipitants on prevention of secondary sediment of shoyu. (Cent. Res. Lab., Kikkoman Shoyu Co., Ltd., Chiba, Japan). Hakko Kogaku Zasshi 1970, 48(10) 622-7 (Japan).

Prevention of secondary sediment of shoyu (soy sauce) with adsorbents and precipitants was investigated. It was obsd. that a treatment of shoyu with bentonite, acid clay, or active C had a strong effect on the prevention of the sediment. When shoyu was treated with these adsorbents above 80°, prevention of the secondary sediment could be expected but little effect was obsd. below 70° Acid clay adsorbed part of the N compds. and also the color of shoyu to some extent when it was applied to shoyu above 80°, but it hardly adsorbed free amino acids. From these

data the N compds., higher peptides or proteins, were considered to be adsorbed by acid clay. On the other hand, it hardly adsorbed metal ions such as Fe and Si in shoyu. A very small amt. of elution of Al from acid clay into shoyu was obsd.
CA, V. 74, 1971: 52090b

HASHIMOTO, H.; YOSHIDA, H.; et al.
Sediment of soy sauce. IV. Precursor of secondary sediment of soy sauce. (Cent. Res. Lab., Kikkoman Shoyu Co., Ltd., Chiba, Japan). Hakko Kogaku Zasshi 1970, 48(10), 628-34 (Japan).

Proteins in raw and the heat-processed soy sauce which was treated with acid clay and the substances which were adsorbed into acid clay were studied. The proteins of both raw and heated soy sauce with acid clay were collected by gel filtration on Sephadex G-50. From these chromatograms, it was considered that the proteins in soy sauce could be adsorbed by acid clay at an elevated temp. The protein fraction obtained from raw soy sauce became turbid, and soon a flocculent ppt. sepd. by heating the soy sauce at 85° for 30 min or by adding precipitants such as trichloroacetic acid, pieric acid, or sulfo-salicylic acid. The protein fraction obtained from heat-processed soy sauce which was treated with acid clay did not become turbid by the above treatment. The crude ext. from the acid clay which was mixed in soy sauce was composed of 53% protein, 27% ash, and 7% sugar. The insol. portion of this crude prepn. was composed of 82% ash, 17% protein, and 0.4% sugar. A fractionation of the sol. portion through Sephadex G-50 revealed that the principal constituent of the higher mol. substances was protein combined with sugar at about 18%.
CA, V. 74, 1971: 52091c

HASHIMOTO, H.; YOSHIDA, H.; et al.
Sediment of shoyu. V. Composition of sediments formed by heating of raw shoyu, and isolation of precursors of the sediments. (Cent. Res. Lab., Kikkoman Shoyu Co., Ltd., Noda, Japan). Hakko Kogaku Zasshi 1971, 49(7), 642-41 (Japan).

The 1st sediments of raw shoyu (soy sauce), which were formed by heating at 85° for 30 min, were composed of 81.6 protein, 15.2 carbohydrate, and 2.3% ash. The yield of this sediment from soy sauce was ~ 2 mg/1. The 2nd sediment, formed after sepn. of the 1st sediment by treatment of the mother liquor at 55° for 4 days, was composed of 89.2 protein, 9.6, carbohydrate, and 1.2% ash which was almost all phosphate. The yield of the 2nd sediment was 252 mg/1. The 2nd sediment was solubilized by hydrolysis with Pronase P, the purified protease from Streptomyces griseus, at pH 6.5; this treatment liberated peptides and amino acids. The 2nd sediment was not hydrolyzed by the same enzyme in the presence of 2M NaCl at pH 5.0. Precursors of the sediment which are sol. in soy sauce, but which would be deposited by heating, could be isolated from raw soy sauce by dialysis, fractionation with acetone, gel filtration on Sephadex G-50 and G-100 columns, treatment

with Amberlite XE-64, and chromatog. on a DEAE-cellulose column. One of the precursors of the heating sediment was the amylase produced by Aspergillus soyae.
CA, V. 75, 1971: 87073w

IKEBE, H.; FURUSHO, S.
Deterioration of seasoning. I. Butyl p-hydroxybenzoate and iron in soy sauce. (Kumamoto Prefect. Ind. Exp. Stn., Kumamoto, Japan). Chomi Kagaku 1974, 21(4), 21-3 (Japan).

Bu-p-hydroxybenzoate [94-26-8], added to raw soy sauce, decreased to 45-64% in products, because of adsorption on sediments or salting-out with NaCl. Fe [7439-89-6] dissolved in soy sauce, arose from soybeans and the cooking kettle.
CA, V. 84, 1976: 29411e

NAKAYAMA, S.; TAKEDA, R.
Effects of iron on the color of shoyu [soy sauce]. II. Determination of iron in shoyu. (Kagawa Prefect. Ferment. Food Expt. Sta., Shodo, Japan). Chomi Kagaku 1969, 16(6), 11-17 (Japan).

Fe^{3+} in soy sauce was reduced to Fe^{++} with hydroxylamine sulfate. Fe^{++} originally present was not affected by this redn. Fe^{++} was complexed at pH 5-7 with nitroso-R salt or disodium 2-hydroxy-1-nitroso-naphthalene-3,6-disulfonate, and the complex was measured at 716 mμ. The sample was dild. to 500-fold before anal.
CA, V. 73, 1970: 43958t

NAKAYAMA, S.; TAKEDA, R.
Effect of iron on the color in soy sauce. II. Determination of iron in soy sauce. (Kagawa Prefect. Ferment. Food Exp. Stn., Uchinomi, Japan). Kagawa-Ken Hakko Shokuhin Shikenjo Hokoku 1970, (62), 24-31 (Japan).

The conditions for detg. Fe with di-Na 2-hydroxy-1-nitroso-naphthalene-3,6-disulfonate (I) were detd. in soy sauce. Dil. 1 ml soy sauce to 100 ml, place 10 ml in a 50-ml volumetric flask, add 1 ml 10% hydroxylamine sulfate (II), 1 ml 0.5% I, and 30 ml pH 6.0 buffer and dil. to vol. Det. total Fe by measuring the absorbance at 716 mμ after standing at 30° for 20 hr. Det. Fe^{2+} without adding II. The recovery rates of 1.24 μg/ml Fe^{2+} and 0.62 μg/ml Fe^{3+} added to soy sauce contg. 5.7 μ g/ml Fe were 97.9-99.7%. Fe (56.6 ppm) found by this diln. method of soy sauce was almost the same as Fe (57.0 ppm) found by degradation with H_2SO_4 and $HClO_4$. A sample of soy sauce contained 45 ppm Fe^{2+} and 12 ppm Fe^{3+}
CA, V. 75, 1971: 150390q

SUTMAN, Y.M.
The incident of the pathogenic bacteria (Salmonella and shigella) in the preparing materials for producing tauco and kecap and environmental factors. Thesis. Biology Department, Bandung Institute Technology 1976, 55p.

The presence of pathogen and toxin producing microorganisms on food material has long been known. Traditional fermented food, such as

tauco and soy-sauce does not escape from the growth of these pathogen and toxin producing microorganisms. Water, mixed material, soil, air and other favourable environment are usually major sources of food contamination by pathogen microorganisms. The result of study conducted at the Biology Department of I.T.B. showed that the presence of Salmonella and Shigella on the raw material of tauco and soy-sauce was caused by unaseptic procedures and unsanitary environment practiced throughout the preparation of these food products.
Author

TAKEDA, R.; IKEBE, H.; et. al.
Antimicrobial activity of sodium benzoate in soy sauce. I. (Kagawa Fermented Foods Expt. Station, Uchinomi, Japan). Kagawa-ken Hakko Shokuhin Shikenjo Hokoku 1962, 54, 25-32 (Japan).

The growth of Zygosaccharomyces japonicus in soy sauce at around pH 4.8 was initiated by the addn. of 4×10^{-4} (as BzOH) NaOBz to soy sauce contg. $<$ 1% N, and by addn. of 3×10^{-4} to soy sauce contg. $>$ 1.2% N. The growth of the yeast in a pH 4.6 soy sauce contg. 13.8% NaCl and 26.9% total sugar was inhibited by the addn. of 4×10^{-4} BzOH. The growth of the yeast was not inhibited in a pH 5.2 soy sauce contg. 20.0% NaCl and 1.01% N by the addn. of 8×10^{-4} BzOH. No change in flavor was observed after the addn. of 10^{-3} BzOH to soy sauce.
CA, V. 65, 1966: 4530h

TAKEDA, R.; TANIGAWA, Y.; et. al.
Effect of iron on the color of soy sauce. I. Inhibition of color darkening in soy sauce. (Kagawa Prefect. Ferment. Food Exp. Sta., Uchinomi, Japan). Kagawa-Ken Hakko Shokuhin Shikenjo Hokoku 1969, No. 60, 1-5 (Japan).

When 300 cm^3 brewed soy sauce contg. 0.1 g powd. Cu, gun metal, stainless steel, Fe, or mixts. of the metals was kept in a sealed container at room temp. for 130 days, the color of the soy sauce became darker following addn. of Cu, gun metal, and stainless steel, but it became lighter than the control on the addn. of Fe powder (even in the presence of Cu powder). The color of brewed soy sauce was darkened by the addn. of powd. Fe rust. Since Fe in brewed soy sauce, which was stored for 4 months with Fe powder, was blocked with phytic acid, the color of the lotus rhizome did not become black after cooking in the treated soy sauce.
CA, V. 72, 1970: 2311n

TAKEDA, Y.; KAGAMI, M.
Concentration of soy sauce by use of ion-exchange resins. (to Takeda Foods Co.). Japan. 4441('55), June 28.

Soy sauce is passed through a column of a cation-exchange resin regenerated with HCl, H_2SO_4, or NaCl, and the filtrate concd. to 1/4 vol. The flavor of the soy sauce, which is adsorbed on the column, is eluted with N HCl, adjusted to pH 4.4-4.6 with

NaOH, and added to the concd. filtrate to give a concd. soy sauce of a superior fresh flavor.
CA, V. 51, 1957: 13311d

TODANI, T.; OKADA, N.; et. al.
Effects of food preservatives on foods boiled down in soy sauce. II. Effect of sodium chloride on the effectiveness of food preservatives. (Food Ind. Expt. Sta., Hiroshima, Japan). Nippon Shokuhin Kogyo Gakkaishi 1966, 13(4), 130-2 (Japan); cf. preceding abstr.

A tangle food boiled down in soy sauce contg. 25% NaCl could be preserved for 60 days without adding K benzoate. The addn. of 0.1% K benzoate reduced the necessary NaCl concn. to 10%.
CA, V. 65, 1966: 15978e

AOKI, S.; AIHARA, S.
Quality of soy sauce during storage in bottles. (Food Ind. Guid. Stn., Japan). Chomi Kagaku 1970, 17(6), 201-14 (Japan)

Color increase due to sunlight did not depend on the packaging or soy sauce components, but on the amt. of air or O, and on the content of low-mol.-wt. components (reducing sugars and amino acids). The greater the increase in coloration, the lower the sugar content and the higher the activity. Preserved soy sauce contained more Et formate, butyraldehyde, and EtOAc. When the sauce was stored in bottles made of poly(vinyl chloride), butyraldehyde increased more than in bottles made of glass.
CA, V. 75, 1971: 150413z

CHONG, C.H.
The biochemical studies on stored soy-sauce. J. Kor. Agr. Chem. Soc. 1968, 9, 9-27. Fig. 9 Tab. 17 Ref. 81.

Studies were carried out in order to elucidate chemical components and microflora in three types of soy-sauce, 12-year aged soy-sauce prepared by improved method, 7-year aged and 20-year aged soy-sauce prepared by ordinary method.
Korean Sci. Abstr., V. 1, 1969: 102

IRIE, T.; YAMAZAKI, I.
Color determination of soy sauce (shoyu) by the Pulfrich photometer. II. Color change of soy sauce during storage. (Kyushu Univ., Fukuoka). J. Soc. Brewing, Japan 1954, 49, 27-30; cf. ibid 1951, 46, 223.

The color intensity of com. bottled soy sauce increased twice in the course of 1 year storage, and the color tone became

darker. The color change was more rapid at a higher temp. The coloring of chem. and semichem. moromi juices was more remarkable than that of naturally brewed ones. Color filters used were S61, S57, S53, S50, and S47.
CA, V. 49, 1955: 6537i

KAMATA, H.; SAKURAI, Y.
Discoloration of soy sauce during storage. (Food Research Inst., Tokyo). Shokuryo Kenkyusho Kenkyu Hokoku 1954, No. 9, 115-19.

Soy sauce (shôyu) darkens during storage. This is detrimental for soy sauce of the light-color (usukuchi) type (I). Examns. of storage conditions showed that I darkened more as the temp. was higher (5, 20, and 38° compared), as the empty space in the vessel was larger, and under O than under N or CO_2. O was necessary for darkening. This browning was nonenzymic, since heating for 1 hr. at 100° did not influence the browning. Light or dark storage did not concern the browning. Addn. of 1% amino acid (especially glycine, tryptophan, or tyrosine) or sugar (especially xylose or arabinose) accelerated the browning. Prevention of browning by chemicals seemed difficult. Effective were CO reagents ($NaHSO_3$, KCN, hydroxylamine, semicarbazide, urea, and thiourea; however, phenol and hydroquinone accelerated), NH_2 reagents ($SOCl_2$, formalin, and $PtCl_4$), org. acids (malonic, oxalic, tartaric, fumaric, and malic, but to a lesser extent), and surface-active agents (Antarox A-400, Triton K-60, and Triton X-200 were slightly effective).
CA, V. 53, 1959: 10653i

TAKEDA, R.; SHIOTA, O.
Preservation of soy sauce in plastic bottles. (Japan). Kagawa-Ken Hakko Shokuhin Shikenjo Hokoku 1973, 65, 14-30 (Japan).

Poly(vinyl chloride) had less effect on the quality of soy sauce than did polyethylene or polypropylene, when bottles made of these materials were filled with soy sauce and held at 30° for 6 months. Polythylene would be good bottling material if the soy sauce were packed under vacuum.
CA, V. 81, 1974: 48696f

YAMAMOTO, Y.; TSUBOI, Y.
Preservation of soy sauce in containers of various synthetic resins. (Kagawa Prefect. Ferment. Food Exp. Sta., Uchinomi, Japan). Kagawa-Ken Hakko Shokuhin Shikenjo Hokoku 1969, No. 60, 18-22 (Japan).

Light-colored soy sauce was stored in containers made of poly(vinyl chloride), brown and blue colored polyethylene, and 5 plastics for various periods, and the changes of color and chem. compn. of the soy sauce were compared with controls stored in blue glass bottles. All samples became dark during storage, but the soy sauce stored in the containers of synthetic resin became darker than that in the blue glass bottles. The color of soy sauce stored in brown polythylene containers was

darker than that from blue polythylene containers. The color change of soy sauce stored in containers of various synthetic resins was assumed to be caused by the premeability to air.
CA, V. 72, 1970: 2248x

B. TEMPE

a. Method of Preparation

ANONYMOUS
Modern process for making tempeh. Food Processing 1963, 24 (2), 83.

A simple, rapid process for making tempeh, an Indonesian soya bean product, has been developed by fermentation research specialists of the U.S. Dept. of Agriculture. In the modern process, pure strains of the tempeh-producing mould are used, and the soya beans are fermented in a plastic bag. The primitive method uses mixed strains of mould for fermentation and banana leaves for packaging. In underdeveloped countries, where much food is prepared at home, pure strains of the tempeh mould can be used to ferment small batches of soya beans with much greater success than the traditional mixed strains. The research team isolated 39 pure strains of Rhizopus-the tempeh mould. Fermenting soya beans in plastic bags proved to be the most effective way of preserving the fresh flavour of tempeh. Photos.
Royal Tropical Institute, Amsterdam, k13o6

ARBIANTO, P.; SASTRAMIHARDJA, I.
Studies on the preparation of some Indonesian fermented foods (Shoyu, tape and Mucuna tempe fermentation). Regional Training Course on the Conservation and Use of Microorganisms for Waste Recovery and Indigenous Fermentation. Proceeding ITB 1974, 9, 324-9

To study soysauce fermentation; To study mold fermentation based on tempe process; To study conversion of rice or cassava to a sweet sour, alcoholic food improved nutritional value.
Author

BAI, R.G.; PRABHA, T.N.; et al.
Tempeh. I. Processing and nutritional evaluation of tempeh from a mixture of soybean and groundnut. (Cent. Food Technol. Res. Inst., Mysore, India). J. Food Sci. Technol. 1975, 12(3) 135-8 (Eng).

A process for the prepn of tempeh (a fermented soybean food) with a mixt. of groundnut and soybean was standardized. Tempeh was prepd. with 3 strains of R. oligosporus NRRL 2710, 2549, and 514. A tempeh-like product could be prepd. successfully with a mixt. of soybeans or a mixt. of soybean and groundnut resulted in an increase in the crude fiber, fat, and sol. solids. No differences were obsd. in the growth rates of rats or PER or NPU when autoclaved unfermented soybeans and soybean tempeh samples were fed. Tempeh prepd. from a mixt. of soybean and groundnut had a

better protein quality than soy tempeh. All the tempeh samples tested had PER values >2.0.
CA, V. 83, 1975: 176955t

HERMANA; SUTEDJA
Tjara baru pembuatan tempe. (The new method of preparing tempeh). Penelitian gizi dan makanan 1971, 1, 68-71. Gizi Indonesia, 1970, 2, 167-168.

The new method of preparing tempeh involves dehulling of soybean by a burr mill, cooking in water up to the boiling point, soaking in the water used to boil for 22 hours, washing, and reboiling in fresh water. After draining, the beans were left to cool, followed by inoculation with tempeh mold inoculum and wrapping in cheese cloth for 24 hours. Fermentation for 14 to 16 hours were allowed after bagging the beans in perforated polyethylene film having pin-holes one in four square centimeters. Tempeh made by the new method was of milder aroma than traditional tempeh. The keeping quality was three days. On the third day the colour of tempeh remained white, changes in texture and aroma were slight.
Author.

HESSELTINE, C.W.; et al.
A mould inhibitor in soybeans. Nature 1963, 200 (4912), 1226-7.

In the preparation of tempe from soya beans, the water in which the beans have been soaked and cooked prior to inoculation with Rhizopus moulds is thrown away. Since this procedure entails a considerable loss of nutrient matter, alternative methods were investigated in the U.S.A. It was found, however, that discarding the soaking and cooking water was indispensable to remove a water-soluble, thermostabile mould inhibiting substance contained in the fresh beans. All 16 varieties examined for the presence of this factor proved to contain it, though in different amounts 4 refs.
Royal Tropical Institute, Amsterdam, m586.

KIM, S.Y.
Preparation of Danjang powder (fermented soybean food). (Food Ind. Dep., Natl. Ind. Res. Inst., Seoul, S. Korea). Kongyon Rebyu 1971, 13(2), 8-12 (Korean).

A brief review of the industrial processing of Danjang powder. A few improvements were proposed with respect to flavor, relative humidity, and storage.
CA, V. 76, 1972: 97958y

LOO, T.G.
Small-scale processing of soybeans and some applications, Amsterdam (the Netherlands), Koninklijk Instituut voor de Tropen. Bulletin of the Department of Agricultural Research 1971, 294(6), 29 p.

Tables. Figs. Refs.

This bulletin discusses small-scale processing methods for soya milk, soya bean curd (toufu), soya bean sprouts, etc. which have been developed by the author. In the first 3 chapters a general in-

troduction of soya beans is given, followed by the chemical composition and nutritive value of soya beans and some soya bean products. Some applications, which are very easy to be made, are given as well. One chapter is devoted to recipes based on soya bean products, eg. soups with soya milk, flavoured soya milk, toufu dishes, use of soya milk residue flour, soya croquettes. soya biscuits, etc. As far as the manufacturing methods described are concerned, efforts have been made to keep them simple enough to be applied by almost any-body. The use of expensive and complicated apparatus has been avoided as much as possible.
Royal Tropical Institute, Amsterdam, v2800.

LOO, T.G.
Small-scale and home processing of soya beans with applications and recipes. (Department of Agricultural Research, Royal Tropical Inst. Amsterdam, Netherlands). Communications - Royal Tropical Institute (Netherlands) 1975, (64), 59 p. [En] figs, photos, tables, 26 rets KIT (D1244).

Glycine max. Grain Legume Products soya bean, Home Economics food recipe, Human Biology & Nutrition nutritional quality. This book presents several methods and examples of possible applications and recipes, mainly based on locally available raw materials and equipment, to improve the diet. They are not beyond the capacity and purchasing power of the population in the tropics and subtropics. The importance of soya beans in the human diet for supplying protein, oil, vitamins and minerals is discussed. In this book emphasis is laid on the application in small-scale, cottage and home industries, and domestic use. The author has avoided the use of sophisticated and expensive equipment in designing the described methods and recipes. With the described applications and recipes, low-cost lunches and dinners can be prepared.
Royal Tropical Institute, Amsterdam, 760695.

LOO, T.G.
Soybeans, soybean products and their application. Amsterdam (the Netherlands), Royal Tropical Institute, Department of Agricultural Research, Product Research Division, 1971. 11 p. Appendix.

This pamphlet was used by the author during a mission to the Rep. of Zambia aimed at the introduction of soya beans for human nutrition. It discusses in detail the manufacture of soya milk, soya bean curd (toufu), soya steak (tempeh) and soya milk residue flour. Some applications of soya beans and soya bean products are discribed in detail. The average chemical composition of soya beans is given in the appendix.
Royal Tropical Institute, Amsterdam, v990.

STEINKRAUS, K.H.; VAN BUREN, J.P.; et al.
A pilot plant for the production of dehydrated tempeh. Fd. Tech. 1965, 19, 63-8 (Eng.).

"The pilot plant produced 54.5 kg. fresh or 27 kg. dry tempeh/day using 1 man 8 hours a day and the equipment described. Step - dehulling, precooking, inoculation with Rhizopus oligosporus, fer-

mentation and dehydration are described with research results. Chemical composition of tempeh is given. Modifications for use at village level are given."
Author.

TAMMES, P.M.L.
De bereiding van tempe. Landbouw 1950, 22 (5/6), 267-270.

Ter verbreiding van het gebruik van kedelee wordt getracht aan de tempebereiding, die typisch Javaans is, meer bekendheid te geven. De bereiding van het entmateriaal (ragi) en van de tempe, ook voor de consumptie.
Royal Tropical Institute, Amsterdam, 3718.

WAHAB, M.N.A.
Proses pembuatan tempe (The process in making tempe). Bandung, Dep. Biol. ITB, 1975, 33 p. A report of practical work.

Various traditional fermented foods are found in Indonesia which are known by society from generation to generation. Among other things favorite fermented foods until now are "tempe", oncom, tape (fermented cassava), soybean sauce and tauco. Tempe and oncom form the diet of the common people taken daily together with rice. Both kinds of foodstuffs are made from easily-obtainable raw materials besides being sold at a relatively cheap price. For this reason a very poor community is able to buy tempe or oncom a substitute as a protein source instead of fish or meat.
Author

b. Microorganism

ABDULLAH MOOSDEEN, F.
Deteksi dan evaluasi jamur penghasil anti biotica yang tumbuh pada makanan tradisi Indonesia yang difermentasikan. (The detection and evaluation of antibiotics producing mycoflora in traditional fermented foods) Thesis Dept Biologi ITB 1974, 47 hal.

Indonesian traditional fermented foods have been very popular in Indonesia. Other than being highly nutritive foods, they are also safe to be taken. The presence of antimicrobial substances in the foods have been able to lessen or supress the outspread of diseases caused by food-borne organisms. The research was made to detect and evaluate the presence of mycoflora in the traditional fermented foods that are able to produce the said substance.
Author

DWIDJOSEPUTRO, D.; WOLF, F.T.
Microbiological studies of Indonesian fermented foodstuffs. Mycopathologia et Mycologia applicata, 1970, 41(3-4), 211-22

Microbiological studies were made of certain Indonesian foodstuffs obtained from Malang, Surakarta, and Jakarta. Saccharomyces cerevisiae and Candida solani were isolated from ragi-roti (a baker's yeast preparation). From ragi-tempe and tempe were isolated Rhizopus oryzae,

R. arrhizus, R. oligosporus, R. stolonifer, Mucor Rouxii, M. javanicus and Trichosporon pullulans. The microbiological flora of ragi-tape was found to include Candida parapsilosis, C. melinii, C. lactosa sp. nov., Hansenula subpelliculosa, H. anomala, H. malanga sp. nov., Chlamydomucor oryzae and Aspergillus oryzae. From ragi-kecap, used to prepare soysauce, were isolated Rhizopus oligosporus, R. arrhizus, Aspergillus oryzae, and A. flavus, the latter species probably being an accidental contaminant. Two new species are described: Candida lactosa and Hansenula malanga, from ragi-tape from Surakarta and Malang, respectively.
1) From a thesis presented to the Graduate School of Vanderbilt University in partial fulfillment of the requirements for the Ph.D. degree, August, 1969.
2) Financial support of Dakimah Dwidjoseputro by the Ford Foundation is gratefully acknowledged. Present address: jl Surakarta 5, Malang, Indonesia. Accepted for publication: 30.X.1969.
Author

FURNELLE, J.
The causes of yeast-cell degradation in bottom fermentations. Influence of soybeans on the fermentation. Rev. fermentations et inds. aliment. 1954, 9, 187-95.

The influence of soybeans on the fermentation is discussed. The medium, yeast-strains employed, and the fermentation conditions are described. Typical fermentations are illustrated in terms of CO_2 evolution, with and without the addn. of soybeans. Curves demonstrate the attenuation and yeast harvest under the same media conditions. It was shown that soybeans increase the attenuation, inhibit the decrease in yeast activity, improve the yeast harvest, and accelerate the speed of fermentation. J. Furnelle and A. Devreux. Ibid. 233-47. —Data are presented which indicate that the addn. of soybeans to the media prevents degradation of the yeast cells. Considerable experimentation was undertaken to verify the fact that the yeast could be carried through 15 generations when soybeans were added to the medium with better attenuations than the control, and with a shorter fermentation cycle, the latter averaging 10 days for the fermentation in which soybeans were added, as compared with 14 days for the control.
CA, V. 49, 1955: 9878b

HERMANA; ROEDJITO, S.W.
Pembuatan laru tempe dan pengamatan kekuatannya selama penyimpanan. (Preparation of tempeh mold inoculum and observation on its activity during storage). Penelitian gizi dan makanan 1971, 1, 52-60.

"Laru" or tempeh mold inoculum can be made by growing tempeh mold on rice or "tiwul" (steamed cassava flour). Mold grown rice or "tiwul" is dried in the sun when the spores are fully mature. It is then ground to powder. The spores may also be taken from the dried rice or "tiwul" by rubbing them off with wheat flour. Rice flour or tapioca may be used as substitutes of wheat flour. The flours are also used to dilute the concentration of the spores in inoculum. Another type of tempeh mold inoculum can be made by grinding dried

tempeh into powder. "Laru" made by growing tempeh mold on rice is the best of the three, is easy to be prepared and is inexpensive. The selflife is at least six months when stored in a closed container at room temperature (25°C).
Author.

KIM, Z.U.; LEE, K.H.
Domestic production of new fermented soybean food. On the manufacturing of tempeh. (Coll. Agric., Seoul Natl. Univ., Seoul, S. Korea). Soul Taehakkyo Nonmunjip, Chayon Kwahak, Saengnongge 1973, 23, 35-49 (Korean).

As a series of studies on the soybean protein and their related substances, 9 samples were collected from 9 places to obtain Rhizopus strains which produced the soybean product tempeh. Among these samples, a total of 18 strains were isolated by the use of the diln. pour plate method. For all isolated strains, primary screening for prodn. of protease, lipase, and amylase was done. Optimum conditions for the action of these enzymes Rhizopus oligosporus and the isolated H-2 strains were pH 6.0 and 40°. As the fermn. progressed, H_2O-sol. N, trichloroacetic acid-sol. N, amino N, peptide N, and sol. solids were measured in the cooked soybeans and 2 kinds of tempeh prepd. with R. oligosporus and the isolated H-2 strains. H_2O-sol. N decreased appreciably in cooked soybeans, but in tempeh it increased by 51% over raw soybeans. The pH of the fermenting beans gradually rose from 5.6 to 7.0.
CA, V. 79, 1973: 64793z

SOETIARTO, S.R.
Identifikasi dan determinasi jamur genus Rhizopus yang berasal dari tempe. (Identification and determination of genus Rhizopus, from tempe. Bagian Biologi ITB 1963. 1-53. Laporan pelajaran tambahan.

25 pure cultures of Rhizopus from tempe were identified and determined for their species names, based on Lendner's key.
Physiological observations include: optimal temperature (in Czapek-Dox-agar); gelatin splitting (in 10% gelatin); milk coagulation; amylum splitting (in Cutter's synthetic medium); different kinds of carbohydrate sources (D-zylose, D-glucose, sucrose, lactose, glycerol, amylum and cellulose, in Cutter's synthetic medium); different kinds of nitrogen sources (asparagin, $(NH_4)_2SO_4$, $(NH_2)_2CO$; KNO_3 and KNO_2, in Cutter's synthetic medium).
The result of the morphological identification and determination are: 9 cultures of Rhizopus chinensis
8 cultures of Rhizopus oligosporus
3 cultures of Rhizopus arrhizus
2 cultures of Rhizopus oryzae
2 cultures of Rhizopus elegans
1 culture of Rhizopus parasiticus.
Author

YAMAMOTO, Y.; MIYAMOTO, T.; et al.
Rhizopus oligosporus growth and folate content of fermented soybeans. (Fac. Sci. Living, Osaka City Univ., Osaka, Japan). Vitamins 1974, 48(4), 195-9 (Japan).

The contents of folate compds. in tempeh were much higher than those produced by R. oligosporus in soybean-potato medium. No inhibitor of folate prodn. was detected in potato ext. nor the boiled soybean juice. The higher folate concn. in tempeh may be due to a higher nutrient folate concn. and suitable conditions for R. oligosporus in the tempeh fermn.
CA, V. 81, 1974: 24405j

VAN VEEN, A.G.; SCHAEFER, H.
Influence of the tempeh fungus on the soybean. Doc. Neerl. Ind. Morb. Trop., 1950, 2: 270

Tempeh kedelee, a fungus (Rhizopus oryzae) product of the soybean, is a cherished food among the Javanese. It is more easily digested than the soybeans themselves. This article deals with the chemical composition of the tempeh; the soluble carbohydrates disappear for the greater part and the protein is broken down into water-soluble

the greater part and the protein is broken down into water-soluble

products. This explains the tolerance for tempeh of most patients with intestinal disorders.
Nut. Bibl. Ind., 1955: 114

c. Fermentation Studies

ARBIANTO, P.; SASTRAMIHARDJA, I.
Soybean tempe fermentation. Regional Training Course on the Conservation and Use of Microorganisms for Waste Recovery and Indigenous Farmentation, Bandung, Institut Teknologi Bandung, August 13-28, 1974. Proceeding ITB 1974, 319-23

To study tempe fermentation. Tempe is a popular food of Indonesia which is prepared from cooked and dehulled soybeans fermented with the tempe mold. The first report on its preparation was made by Geerlings in 1895. It will be noted that other soybean products like tahu, kecap (soy sauce) and taoco originated from China, tempe is a specific Indonesian food.
Author

DJIEN, K.S.; SASTRAMIHARDJA, I.
Some experiments on fermentation of soybeans. Rapat Kerja Kedelai 1964, 28-30 Sept., 11 p. + lamp.

A brief description of the fermentation experiments with soybeans, which are done in the Microbiology Laboratory of the Institute of Technology Bandung. Successively are treated the research results of tempe fermentation, submerged fermentation of soybeans, the use of soybean extract in the culture and fermentation of soybean waste.
Author

EBINE, H.

Fermentation processing of soybeans. (Food Research Inst., Tokyo). Nippon Jozo Kyokai Zasshi 1958,(53), 72-5.

A discussion with 12 references.
CA, V. 55, 1961: 8750d

HESSELTINE, C.W.; WANG, H.L.

Fermented soybean food products. (North. Reg. Res. Lab., Agric. Res. Serv., Peoria, Ill.). Soybeans: Chem. Technol. 1972, (1), 389-419 (Eng). Edited by Smith, Allan Kay. Avi: Westport, Conn.

A review is given of the dietary importance and uses of koji, miso, shoyu, natto, hamanatto, tempeh, and sufu. New soybean products made by fermn. include cheese-type products, fermented soybean milk, and an oncom-type product.
CA, V. 79, 1973: 64580c

ILJAS, N.; PENG, A.C.; et al.

Tempeh: an Indonesian fermented soybean food. Ohio Agr. Res. and Dev. Cent. Wooster, Ohio, 1973, no.394, 36p.

The soybean has been hailed as a crop which could play a major role in feeding the world's starving people. The use of soybeans for food is especially appealing because of the high protein content (about 40%) which is the highest among legumes; the highest nutritive value among all proteins of plant origin; and the cheapest source of protein. Processed soybean food has long been prepared in the orient. A typical example is tempeh, staple soybean food in the Indonesian daily diet. Tempeh has been studied extensively by both government agencies and universities. Until now, however, no publication has comprehensively reported the results of these investigations. The purpose of this review is to compile published information on tempeh for those interested in fermented soybean foods.
Author.

VAN BUREN, J.P.; HACKLER, L.R.; et al.

Solubilization of soybean tempeh constituents during fermentation. (New York State Agric. Exp. Stn., Cornell Univ., Geneva, N.Y.). Cereal Chem. 1972, 49(2), 208-11 (Eng).

After 72 hr fermentation, 52% of the soybean solids were sol. in H_2O and 60% were sol. in EtOH. The H_2O-sol. components were evenly divided between crude protein, N-free ext., and lipids. Half the crude protein, 2/3 the N-free ext., and 1/2 the fat had become sol. in H_2O. The components sol. in EtOH were mainly lipids.
CA, V. 77, 1972: 33061p

WAI, N.

Soybean protein and its fermented products. (Inst. Chem., Acad. Sinica, Taipei, Taiwan). Bull., Inst. Chem., Acad. Sinica 1972, (21), 9-21 (Eng).

The min. quantities of Ca required for the coagulation of glycinins A and B and glutelin were 0.51×10^{-3}, 0.4×10^{-3}, and 0.1×10^{-3} mole of Ca^{2+}/g of protein, resp. The total N of fresh pehtze

was 2.5% of its wet wt. or 8% of its dry wt., and 1-3% of the N could be extd. by water. Anal. of pehtze by gel filtration and electrophoresis showed that a few pooled fractions contained free amino acids and peptides of small mol. wts. Examn. of the pooled fractions by horizontal paper electrophoresis showed that tubes 31-58 contained peptides and 59-92 contained small peptides and the free amino acids aspartic acid, glycine, alanine, glutamic acid, and leucine/ isoleucine. The lipids in pehtze fermented by Actinomucor elegans were partially hydrolyzed during the aging period and the I value decreased gradually.
CA, V. 79, 1973: 103822e

d. Nutritive Values

GIRIJA BAI, R.; PRABHA, T.N.; et al.
Studies on Tempeh: Part I. Processing and nutritional evaluation of tempeh from a mixture of soybean and groundnut. (Central Food Tech. Res. Ins., Mysore, India). J. of Food Sci. and Tech., 1975, 12 (3), 135-138.

A process for the preparation of Tempeh (a fermented soybean food) with a mixture of groundnut and soybean was standardised. Tempeh was prepared with three strains of R. otigosporus NRRL 2710, 2549 and 514. The two types of Tempeh prepared were analysed for ash, moisture, crude fibre, total protein, total fat, total sugars, amino nitrogen, soluble solids and soluble nitrogen. The protein quality of the tempeh samples were evaluated by growth of rats, PER and NPU of diets. It was concluded that a Tempeh like product could be prepared successfully with a mixture of soybean and groundnut. Fermentation of soybeans or a mixture of soybean and groundnut resulted in an increase in the crude fibre, fat and soluble solids. No differences were observed in the growth rates of rats or PER or NPU when autoclaved unfermented soybeans and soybean Tempeh samples were fed. Tempeh prepared from a mixture of soybean and groundnut had a better protein quality than soy Tempeh. All the Tempeh samples tested had PER values above 2.0.
Author.

GYORGY, P.
Stabilized edible oil and fat compositions containing oil of tempeh. U.S. 3,762,933 (Cl. 99/163; A 23d), 02 Oct 1973, Appl. 155,252, 21 Jun 1971; 4 pp.

Tempeh, a fermented soybean product, is extd. with a liq. admixt. contg. a low mol. wt. O-contg. polar aliphatic org. compd. contg. 1-10 C atoms/mol. The resulting liq. ext. phase is recovered and sepd. from the admixt. of aliphatic hydrocarbon and polar org. compd. to produce oil of tempeh. The oil of tempeh is used as an antioxidant to prep. stabilized edible compns., wherein the edible fats or oils are animal fat, vegetable oil, polyunsatd. oil, corn oil, cottonseed oil, lard, olive oil, and soybean oil.
CA, V. 80, 1974: 46650s

GYORGY, P.

Oil of tempeh. U.S. 3,855,256 (Cl. 260-412.8), 17 Dec 1974, Appl. 155, 252, 21 Jun 1971; 4 pp.

Oil of tempeh is prepd. by extg. tempeh with a liq. solvent consisting of a low-mol.-wt. aliph. hydrocarbon and a low-mol.-wt. O-contg. polar aliph. C-10 compd., recovering the solvent ext. phase and sepg. therefrom the solvent mixt. to produce the oil of tempeh. Thus, oil of tempeh was extd. with hexane-EtOH (2:1). The resulting ext. was used as an antioxidant for edible fats and oils.
CA, V. 82, 1975: 123614d

MURATA, K.

Nutritional value of tempeh. (Japan Osaka Shiritsu Daigaku Kaseigakubu Kiyo 1970 (Pub. 1971), 18, 19-33 (Japan).

A review describing the methods of isolation of antihemolytic factors, 4', 6,7-trihydroxyisoflavone and related compds. that were formed during the course of soybean fermentation by Rhizopus oligosporus, their antioxidant activities, and the nutritional values of tempeh. 28 refs.
CA, V. 75, 1971: 87276q

MURATA, K.; IKEHATA, H. et. al.

Studies on the nutritional value of tempeh. (Osaka City Univ., Osaka, Japan). J. Food Sci. 1967, 32(5), 580-6 (Eng.).

Tempeh and unfermented soybeans were analyzed for protein, fat ash, fiber, amino acids, fatty acids (including free fatty acids), thiamine, riboflavine, vitamin B_6, and pantothenic acid. Fermentation produced no major changes in protein or ash content, slightly increased fiber, slightly reduced the fat content but increased the acid value, markedly raised the free amino acid content, and increased the levels of all the vitamins except thiamine.
CA, V. 68, 1968: 2079k

MURATA, K.; IKEHATA, H.; et al.

Nutritional value of tempeh. II. Rat feeding test with tempeh, unfermented soybeans, and tempeh supplemented with amino acids. (Fac. Sci. Living, Osaka City Univ., Osaka, Japan). Agr. Biol. Chem. 1971, 35(2), 233-41 (Eng.).

Compared to unfermented soybeans (fresh or stored), the protein efficiency ratio (PER) of tempeh, fermented with Rhizopus oligosporus, was not significantly different with regards to nutritional value; however, the peroxide value of the oil of stored tempeh powder was only 10% of that of stored soybean powder. Red blood cells of rats receiving tempeh were < 20% in hemolysis by dialuric acid, whereas hemolysis was 100% for the rats receiving the unfermented soybeans. Serum tocopherol was 0.14 mg/dl in the

former group, but 0.07 mg/dl in the latter. Liver TBA (thiobarbituric acid) values were 0.20 O.D./g and 0.65 O.D./g in the tempeh and the unfermented soybeans group, resp. Substitution of whole egg for tempeh to supply 30% of protein in the diet improved the quality of the protein as measured by the PER. An equal improvement was accomplished by supplementation of tempeh with lysine, methionine, and threonine in such amts. as the level of these amino acids equal to that in the tempeh-egg diet.
CA, V. 74, 1971: 108864b

MURATA, K.; MIYAMOTO, T.; et al.
Nutritional value of tempeh. III. Changes in biotin and folic acid contents during tempeh fermentation. (Fac. Sci. Living, Osaka City Univ., Osaka, Japan) J. Vitaminol. (Kyoto) 1970, 16(4), 281-4 (Eng.).

The content of biotin and folic acid compds. in tempeh were 2.3 and 4.5 times, resp., higher in tempeh fermented with Rhizopus poligosorus than in unfermented soybeans.
CA, V. 74, 1971: 98453a

SANKE, Y.; MIYAMOTO, T.; et al.
Nutritional value of tempeh. IV. Biosynthesis of folate compounds with Rhizopus oligosporus. (Fac. Sci. Living, Osaka City Univ., Osaka, Japan). J. Vitaminol. (Kyoto) 1971, 17(2), 96-100 (Eng.).

The formation of folinic acid (I) and rhizopterin (II), by R. oligosporus in a culture medium free of folate was obsd. by bioautog. I was formed in both tempeh and unfermented soybean samples, but II was obtained only from the tempeh sample. By alk. treatment, I and II were decompd. to pteroyl-glutamic and pteroic acids, resp. I had a higher activity in tempeh than in unfermented soybeans.
CA, V. 75, 1971: 108492z

SUDARMADJI, S.
Certain chemical and nutrition aspects of soybean tempe
A disertation, doctor of Philosophy, Dept. of Food Science and Human Nutrition, 1975. 137 p.

Tempe was prepared from soybean and a pure culture of Rhizopus oligosporus. Scanning and transmittance electron micrographs of tempe showed some disruptions of the soybean cell walls and penetration of the mycelium into two layers of cotyledon cells. Based on the liberation of free fatty acids, microbial growth and organoleptic changes, the tempe fermentation may be differentiated into three phases: (I) Rapid phase (0-30 hr.), (II) Transition phase (30-60 hr.), and (III) Deterioration phase (beyond 60 hr. of fermentation). It is believed that primarily the contaminating sporeforming bacteria were responsible for the deterioration of tempe. Frying of tempe in coconut oil resulted in a migration of some free fatty acids, but not glycerides, from tempe into the frying oil. Based on the TBA test and organoleptic evaluation,

fried tempe, stored for 1.5 months, at room temperature, in bags containing air, did not deteriorate. The phytic acid content of soybeans decreased from 1.4% to 1.0% as a result of the tempe fermentation. A strong phytase activity was detected and measured in the tempe and the tempe mold. The pH optimum of this phytase was 5.6 and the Michaelis constant was 0.28 x 10^{-3}M. There were no statistically significant differences in the Protein Efficiency Ratio values (AOAC procedure) between fried soybeans, fried tempe and fried, sesame-supplemented tempe at the 10% protein level in the diet.
Author

YAP, B.H.
Report on special problem: nutritional and chemical studies on tempeh, an Indonesian soybean product. Ithaca, Cornell University, 1960: 30 pp. (Eng.).

A standardized method of manufacturing tempeh, an Indonesian soybean product, was developed. Chemical analyses were conducted on tempeh as well as on the original, unfermented bean. This was followed by a study with rats, to determine the nutritive value of tempeh as compared to the original unfermented soybean and casein. In one experiment the effect of coprophagy was considered.
Author.

e. Prevention of Spoiled Quality

IKEHATA, H.; WAKAIZUMI, M.; et al.
Antioxidant and antihemolytic activity of a new iso-flavone. "Factor 2", isolated from tempeh. (Osaka City Univ., Osaka, Japan). Agr. Biol. Chem. (Tokyo) 1968, 32(6), 740-6 (Eng.).

6, 7, 4' - Trihydroxyisoflavone ("Factor 2"; I) isolated from tempeh, a food produced by growing Rhizopus oligosporus on soy-beans, was synthesized and tested for antioxidant activity. I and its trimethoxy- and triacetoxy derivs. were synthesized from 3,4 - dimethoxyphenol and homoanisonitrile by the methods of T.B.H. McMurry and C.Y. Theng (1960), and S.K. Arora, et. al. (1961). I was a potent antioxidant for vitamin A solns., and for linoleate in aq. soln. at pH 7.4. However, no antioxidant activity was shown when I was mixed with soybean powder or soybean oil and this may have been due to insoly. in the oil and difficulty of dispersion in the powder. I had in vitro antihemolytic activity equiv. to that of DL-α-tocopherol on hemolysis induced by the action of dialuric acid on vitamin E-deficient red blood cells. However, I had no antihemolytic activity in the dialuric acid test when given orally to rats fed a vitamin E-deficient diet; this may be due to low intestinal asorption or low affinity of the tissues. The potent antioxidant activity of the factor in aq. soln. at alk. pH may be related to the ortho-diphenolic grouping which undergoes isomeric change

into a diketonic structure active in the destruction of free radicals.
CA, V. 69, 1968: 42538m

MURATA, K.; IKEHATA, H.
Hemolysis-preventing antioxidant activity of synthesized 6,7,4'-trihydroxyisoflavone and of that isolated from tempeh. (Osaka City Univ., Osaka, Japan). Proc. Int. Congr. Nutr., 7th 1966 (Pub. 1967), 5, 656-9 (Eng.).

Friedr. Vieweg and Sohn: Brunswick, Ger. 6,7,4'-Trihydroxyisoflavone (factor 2) was synthesized and found identical to the isolated compd. The antihemolytic activity of factor 2 in vitro was almost identical to that of vitamin E; the activity of acetoxy- and trimethoxy derivs. was almost negligible. The activity of factor 2 on the rat in vivo was neg. The antihemolytic activities of tempeh were increased from 34 units/g. soybean to 50, 400, and 1000 units/g. tempeh, resp., during fermentation for 24, 48, and 72 hrs. Rhizopus oligosporus, which is responsible for the production of tempeh, has glucosidase activity that liberates antioxidant activity during fermentation.
CA, V. 70, 1969: 19018d

PACKETT, L.V.; CHEN, L.H.; et al.
Antioxidant potential of tempeh as compared to tocopherol. (Dep. Nutr. Food Sci., Univ. Kentucky, Lexington, Ky.). J. Food Sci. 1971, 36(5), 798-9 (Eng.).

The antioxidant potential of tempeh (I) in preserving food oils high in unsatd. fatty acids was investigated. Tocopherol (II)-stripped corn oil was studied. Different levels of I were mixed into the oil and incubated at 37° for up to 6 weeks. Peroxide values were detd. periodically. I inhibited lipid oxidn. Corn oil contg. 50% I showed higher antioxidant activity than oil contg. 25% I, or 0.01 or 0.03% α-II. There were indications that the stability of the antioxidant in I was considerably greater than that of α-II.
CA, V. 75, 1971: 117211j

PARK, T.W.; WANG, K.S.; et al.
Soybean mash. III. The variation of the free-amino-acid content in soybean mash during its fermentation. Bull. Sci. Research Inst. (Korea) 4, 1959, No. 1, 31-4.

Soybean mash is an important source of protein in Korea. The free amino acids present are leucine, phenylalanine, valine, glutamic acid, tyrosine, histidine, lysine, alanine, proline, and arginine. The variations of amino-acid content during its fermentation were detd. by ion-exchange, paper-chromatographic, and spectrophotometric techniques. There was a significant decrease of free amino acids during the 1st 2 months and a slight increase after the 3rd month. Lysine is particularly high in this food. Soybean mash may be valuable supplemental food among the rice-eating population.
CA, V. 53, 1959: 22561f

SHUIB, Z.
The incident of the pathogenic bacteria produce toxin on tempe and oncom processing and environmental factors. Thesis. Biology Department, Bandung Institute of Technology. Th. 1975. 55 hal.

Food contamination by microorganisms, may be caused by flies, dirty hands, unhygienic food processing and unhealthy surrounding. The main sources of the pathogenic bacteria are water, waste materials, soil, air, and environmental factors which are necessary for the life of the bacteria. Such steps as food quality control and safety are therefore necessary for food processes in order to guarantee their quality and sanitation. This research is meant to detect incident pathogenic bacteria (Salmonella and Clostridium) on tempe and oncom processing.
Author

SUGIMOTO, Y.; MURATA, K.
Antioxidation factors in tempeh, a fermented soy-bean preparation. (Japan). Osaka Shiritsu Daigaku Kaseigakubu Kiyo 1972, 20, 13-19 (Japan).

Two fractions isolated from tempeh showed an antioxidant behaviour against linoleic acid, one with an R_f of 0.04 and the other 0.17 by paper chromatog. with BuOH-AcOH-H_2O (4:1:1) as a developing solvent. Both showed the same absorption max. at 260 nm., were H_2O- and EtOH-sol., and showed a pos. Emmerie-Engel reaction.
CA, V. 79, 1973: 64792y

C. NATTO

a. Method of Preparation

KIM, Z.U.; CHO, S.H.
A study on the manufacturing of soysauce by the combined use of Aspergillus sojae and Bacillus subtilis. J. Kor. Agr. Chem. Soc. 1975, 18 (1), 1-9. (Article in Korean)

In order to study on the preparation of improved soysauce, Koji (soybean and wheat mash fermented by the strain Aspergillus sojae), Koji-Natto (mixed with the various proportion of Koji to Natto; 8:2,6:4,4:6,2:8) and Natto (prepared using the strain: Bacillus subtilis) were prepared as soysauce materials. Sensory evaluation for the soysauces made from above-mentioned soysauce materials and the contents of total nitrogen, amino nitrogen, ammonia nitrogen, reducing sugar, total acid and enzyme activity were determined.
The results were summarized as follows:

1. Protease activity of Natto was over twice higher than that of Koji and amylase activity of Koji was three times higher than that of Natto. Koji-Natto showed successive increase of amylase activity and successive decrease of protease activity as Koji proportion was increased to Natto.
2. The contents of total nitrogen and amino nitrogen in all the soysauce mashes displayed linear increases or no changes of

these contents as aging. The contents of total nitrogen and amino nitrogenin the mashes were higher as Natto proportion increase to Koji during the aging period.

3. In Natto soysauce mash and Koji-Natto soysauce mashes the contents of ammonia nitrogen were gradually increased until 1∾2 months and rapidly reduced after that period, while Koji soysauce mashes were continually increased.
4. In all the soysauce mash the reducing sugar increased preeminently until the two months and after then there was a rapid decrease as aging the contents of reducing sugar in the mash were higher as Natto proportion increased to Koji during aging period.
5. The total acid of Koji-Natto (8:2) soysauce mash showed gradual increase as aging, while contents of total acid in Natto and other Koji-Natto soysauce mashes increased preeminently until 50 70 days aging, after then decreased.
6. The results of sensory evaluation for three-month-fermented soysauces showed the most excellent in Koji-Natto (6:4) and successive order in the soysauces consisting of Koji and Natto proportion: 8:2, 10:0, 4:6, 2:8, 0:10.
Korean Sci. Abstr., V. 8 (4) 1976: 550

SAITO, T.; ISO, N.; et al.
Conformational change of a natto mucin in solution. (Dep. Food Sci. Technol., Tokyo Univ. Fish., Tokyo, Japan). Agric. Biol. Chem. 1974, 38(10), 1941-6 (Eng).

The mucin obtained from a natto bean sample was composed of 58% of γ-polyglutamic acid and 40% polysaccharide. The ration of L- and D-glutamic acid was 58:42, detd. with L-glutamic acid decarboxylase. The wt.-and z-av. mol. wt. were 2.08 X 10^5 and 2.22 X 10^5, resp. The distribution curve of the sedimentation coeff. showed a small heterogeneity. The mucin mol. was considered to be randomly coiled at pH 5.0-8.8 and to be a rodlike mol. in the lower pH region.
CA, V. 82, 1975: 52969k

b. Microorganism

LEE, K.S.; CHUNG, D.H.
Effect of Bacillus natto on the soybean paste. Kor. J. Food Sci. Technol. 1973. 5 (3), 163-168, 6 Fig. 2 Tab. 33 Ref.

In order to study on the effect of Bacillus natto on the soybean paste used natto, there were determined the contents of total nitrogen, amino acid, ammonia-nitrogen, total acid, reducing sugar and proteolytic activity etc.
The results are summarized as follows:

1. Fermentation of natto paste were faster than koji paste and the fermentation period were sufficient in thirteen days.
2. The chemical components, color, taste and flavor of natto paste (added 15% natto) were excellent than the other soybean paste.

3. The contents of ammonia-nitrogen and amino acid of soybean paste were gradually increased during thirteen days in the fermentation, while total nitrogen contents were decreased.
4. After thirteen days of the fermentation, the contents of amino acid were decreased.
5. The contents of amino acid of natto paste were much more those of koji paste.
6. Total acid and reducing sugar contents indicated rapid increase from nine to fifteen days during the fermentation, and a slower decrease after fifteen days.
7. Total acid and reducing sugar contents of natto paste were somewhat higher than those of koji paste.
8. No significant difference was observed in the contents of reducing sugar and total acid according to the amount of natto added.
9. The contents of reducing sugar and amino acid were proportional to the proteolytic activity.
10. A good soybean paste may be produced by adding 15% natto to the raw material in thirteen days of the fermentation.

Korean Sci. Abstr., V. 5, 1973: 836

c. Fermentation Studies

HESSELTINE, C.W.; WANG, H.L.

Fermented soybean foods. Proceeding workshop, Univ. of Iowa, Iowa City, Iowa, June 15 - July 2, 1970, 1973, 136-148.

Soybean are soaked in water for 12 to 20 hours, then cooked until tender. After cooling to 40°C the beans are inoculated with spores of Bacillus natto. Packed in wooden boxes and incubated at 40°C for 12 to 20 hours.
Author.

SUNDHAGUL, M.; et al.

Thua-nao: a fermented soybean food of northern Thailand. I. Traditional processing method. Thai J. Agr. Sci. 5. 1, 43-56 (1972).

The traditional method of making a fermented soya bean product called thua-nao was investigated. Microbial studies showed that the fermentation was caused by a Gram-positive spore-forming bacterium (Bacillus subtilis) of which 2 strains (N-4 and N-8) were isolated. The ability of pure cultures of the strains to cause normal fermentation suggested that controlled fermentation can be accomplished in the production of thua-nao. It is, there-fore, possible, by controlled fermentation, to produce a better sanitary and more uniform product. The product has high protein and fat contents. The long shelf-life of the product, prepared as dried chips, and its simple processing method make thua-nao an interesting product for future development of inexpensive high-protein foods. Tables. Fig. 8 refs.
Royal Tropical Institute, Amsterdam, V. 2639.

d. Nutritive Values

ARIMOTO, K.; TAMURA, E.; et al.
Nutritional value of soybean products. I. Nutritional value of "natto"-like product prepared by various processing conditions. (Natl. Inst. Nutr., Tokyo). Kokuritsu Eiyo Kenkyusho Kenkyu Hokoku 1962, 40-5 (Japan).; cf. following abstr.

The nutritional value of powd. natto, a fermented (Bacillus natto) product of cooked soybean, was investigated. No differences in the protein digestibility in vitro was found among the products prepd. under different levels of absorption (80-120%) and under different drying conditions (5°, 14 hrs. in vacuo; 60°, 8 hrs.). The water-sol. N content was higher in the vacuum-dried product. Protein digestibility in vitro was slightly improved by prolonging the fermentation period ≦8 hrs. In a rat-feeding expt., A selected Torulopsis strain, e.g. T. versatilis, is used with Saccharomyces rouxii for soy sauce brewing at 30-5° for 3 months to give a product of enhanced flavor with a 4,2-Et(MeO)C_6H_3OH content of 0.1-10 ppm.
CA, V. 66, 1967: 1687q

ARIMOTO, K.; TAMURA, E.; et al.
Nutritional value of soybean products. II. Effect of hulling of soybean and freeze-drying of fermented product on nutritional value of "natto"-like product. (Natl. Inst. Nutr., Tokyo). Kokuritsu Eiyo Kenkyusho Kenkyu Hokoku 1962, 51-3 (Japan); cf. preceding abstr.

Fermented products from hulled soybean showed a slightly higher biol. value than that from soybean with hulls. In a rat feeding expt., there was no significant difference in the growth efficiency ratio produced by the fermented products before and after freeze-drying; however, the freeze-dried product showed a slightly lower protein efficiency ratio than an undried product.
CA, V. 66, 1967: 1688x

ARIMOTO, K.; TAMURA, E.; et al.
Nutritional value of soybean products. III. Effect of drying methods on the nutritional value of "natto"-like product. (Natl. Inst. Nutr., Tokyo). Kokuritsu Eiyo Kenkyusho Kenkyu Hokoku 1962, 53-4 (Japan); cf. preceding abstrs.

In rat-feeding expts., a slight lowering of protein biol. value occurred when a dried product was used; however, the protein biol. value was markedly reduced when a vacuum-dried product (30-60° under 50 mm. Hg) was used as compared with a freeze-dried product.
CA, V. 66, 1967: 1689e

GOTO, K.
Lipid-orgin flavor constituents of natto (fermented soybeans). I. Fatty acid composition and fractionation of total lipids. (Lab. Gen. Chem., Obihiro Zootech. Univ., Obihiro, Japan).

Obihiro Chikusan Daigaku Gakujutsu Kenkyu Hokoku, Dai-1-Bu 1974, 8(3), 501-7 (Japan).

No significant difference was found between the fatty acid compns. of natto and soybeans. The predominant fatty acid was linoleic acid followed by oleic, linolenic, and stearic acid. Total lipid consisted of at least 8 components. The main constituents were triglycerides, free fatty acids, diglycerides, monoglycerides, and traces of polar lipid. Sepn. of 10 carbonyl compds which form $MeNO_2$-sol. 2,4-dinitrophenylhydrazine derivs. was possible.
CA, V. 81, 1974: 150588j

KITASATO, T.; INABA, A.; et al.
Viscous substances of natto. I. Gifu Daigaku Gakugeigakubu Kenkyu Hokoku Shizen Kagaku 1961, 2(5), 484-5 (Japan); cf. following abstr.

The viscous material which covers natto was studied. Natto is made by incubation of Bacillus natto on boiled soybeans. When the viscous material is stirred, it gives thin and long threads which comes out with the stirrer as it is withdrawn. The ppt. obtained by the addn. of aq. $CuSO_4$ to the aq. ext. of the viscous material was treated with alc. HCl, then the soln. was dialyzed and treated with ion-exchange resins. An acidic polysaccharide, resistant to acid hydrolysis, was obtained. The addn. of alkalis to a 50% MeOH soln. of this polysaccharide gave a highly viscous gel.
CA, V. 68, 1968: 2001d

KITASATO, T.; OJIO, S.; et al.
Viscous substances of natto. II. Purification of viscous substances. I. Gifu Daigaku Gakugeigakubu Kenkyu Hokoku Shizen Kagaku 1964, 3(3), 263-5 (Japan); cf. preceding abstr.

The viscous substances of natto are classified by the difference of soly. at pH 2.2. An aq. soln. of the salts of alkali metals of these viscous substances is highly viscous and can be pptd. by the addn. of $CuSO_4$, $AgNO_3$, $KAl(SO_4)_2 \cdot 12H_2O$, etc. They are high-mol.-wt. compds. contg. pentoses, hexoses, uronic acids, and acidic amino acids.
CA, V. 68, 1968: 2002e

KITASATO, T.; OMAE, K.; et al.
Viscous substances of natto. II. Purification of viscous substances. 2. Daigaku Kyoiku Gakubu Kenkyu Hokoku 1966, 3(5), 539-40 (Japan); cf. preceding abstrs.

A new type of substance, termed viscous substance C was obtained by treating the Cu salt of a viscous substance of natto with a mixt. of 2 vols. concd. HCl and 98 vols. EtOH. This soln. gives a peptide consisting of glutamic acid and an extremely small amt. of polysaccharide.
CA, V. 68, 1968: 2003f

TOYA, N.
Chemical studies on the manufacture of natto. I. Changes of various types of nitrogen during the process. (Kumamoto Women's Coll.). Kumamoto Joshidaigaku Gakujitsukiyo 1956, 8, 114-16.

Changes of the amts. of total N, amino acid N, ammonia N, and sugars during the fermentation of soybeans by Bacillus natto were detd. for 72 hrs. About 24 hrs. from the start, the amt. of total N had a min. At this period, soybean became natto, and this new natto was gradually ripened at the latter period.

II. Changes of free amino acid contents in natto during the process. Ibid. 117-23.

The amt. of free amino acids in soybeans, natto, and B. natto and also its changes during the fermentation were detd.
CA, V. 53, 1959: 22600g

D. MISO

a. Method of Preparation

EBINE, H.; NAKANO, M.; et al.
Manufacture of enriched miso. VI. Effect of added methionine on the quality of miso. (Food Res. Inst., Tokyo, Japan). Shokuryo Kenkyusho Kenkyu Hokoku. 1968, (23), 5-8 (Japan).

To improve the protein value of miso, which is deficient in S-contg. amino acids, a method of fortification with DL-methionine (I) was investigated. When 0.2-0.3% I was added at the start of fermentation, a significant loss of I and the occurrence of off-flavors were observed in the product. Adding I to the ripened miso followed by pasteurization avoided the undesirable results.
CA, V. 69, 1968: 42880s

EBINE, H.; SAKANO, K.; et al.
Manufacture of enriched miso. VII. Addition of L-methionine, DL-methionine, and methionine sulfoxide. (Food Res. Inst., Tokyo, Japan). Shokuryo Kenkyusho Kenkyu Hokoku. 1968, (23), 9-13 (Japan).

To light yellow and dark-colored rice misos, 0.2% methionine (I) derivs. were added, and the samples were stored for 1 month at 30° with or without pasteurization at 60° before the storage. In organoleptic qualities, there was no significant difference among stored misos with added L-I, DL-I, or I sulfoxide. Non-pasteurized miso was a little better than pasteurized, although the difference in the amt. of remaining I between them was not significant.
CA, V. 69, 1968: 42881t

EBINE, H.; YAMAMOTO, K.

Miso manufacturing from dehulled soybeans. II. Evaluation of dehulled soybeans for miso making. (Food. Res. Inst., Tokyo, Japan). Shokuryo Kenkyusho Kenkyu Hokoku. 1968, (23), 1-4 (Japan).

By soaking and cooking soybeans in an excess of water, which is the initial process of miso manufg., > 10% of dry matter of dehulled beans dissolved, resulting in loss of product yield. The compn. of the dissolved fraction was N 4.22, lipids 0.6, ash 10.6, total sugars 41.4, reducing sugars 3.8, and pentosans 9.3%. Free fructose, sucrose, raffinose, and stachyose were present in this fraction, and arabinose was present in the dil. HCl hydrolyzate.
CA. V. 69, 1968: 42879y

FUKUNAGA, Y.

Use of waste liquor from boiled soybeans in the manufacture of miso. Preliminary experiment. (Fukushima Prefect. Ind. Exp. Stn., Fukushima, Japan). Miso No Kagaku To Gijutsu 1973, 237, 27-30 (Japan).

To the waste liq. which was adjusted to pH 4.0 with HCI was added a mixt. of Dricellase (cellulase) and Uniase (amylase) at 0.1% and the medium was kept at 45° for 3 hr. The enzyme treatment resulted in the increase in reducing and total sugars and reduced viscosity and foaming ability of the waste liq. The conc. of the treated waste liq. can be utilized as a sweetening agent in the manuf. of miso or for a yeast medium.
CA, V. 82, 1975: 169027t

HOSOKAWA, N.; YOSHII, H.

Production of miso and soybean paste with the use of enzyme preparations. (Food Res. Inst. Aichi, Nagoya, Japan). Nippon Jozo Kyokai Zasshi 1973, 68(3), 195-8 (Japan).

Miso manuf. was done by use of enzyme prepns. from various microbes; viz., Bacillus, Aspergillus oryzae, A. niger, A. melleus, and Rhizopus. Only the A. oryzae prepn., applied singly or as a mixt. with other enzyme prepns., could make good quality of miso similar to that made with rice koji. The resulting miso had less amino acid content but was rich in reducing sugars and had a dark but vivid color.
CA, V. 79, 1973: 41146b

HOSOKAWA, N.; YOSHII, H.

Production of miso and soybean paste, with the use of enzyme preparations. II and III. (Food Res. Inst. Aichi, Nagoya, Japan). Nippon Jozo Kyokai Zasshi 1973, 68(4), 297-304 (Japan).

Miso was made exptl. with use of 2 enzyme prepns. prepd. from Aspergillus oryzae; viz., A_1 with higher protease activity and A_2 with higher amylase activity. Miso with an agreeable flavor was obtained by use of these prepns. However, the degree of protein digestion was less esp. with use of the A_2 prepn. Good

miso was made with the A_1 prepn. the quality of which was further improved by use of koji made of white rice bran.
CA, V. 79, 1973: 41147c

SATO, T.; SAKAGUCHI, Y.
Steaming of soybeans under high pressure in the manufacturing of miso. (Shinshu Miso Co., Komoro, Japan). Miso No Kagaku To Gijutsu 1974, 241, 11-17 (Japan).

Soybeans were immersed in H_2O with $Na_2S_2O_4$ at 0-1.2% for 20 hr at 20° and then steamed at 0.5-1.0 kg (low pressure) or 2.0-3.0 kg (high pressure)/cm2 for 20 sec to 36 min. Addn. of $Na_2S_2O_4$ at 0.7% was suitable from the standpoint of the control of residual SO_2 and browning of steamed soybean. When no $Na_2S_2O_4$ was used, steamed soybean under high pressure was preferable to boiled soybean or steamed soybean under low pressure to obtain miso with a color tone. Browning of steamed soybean was greatest after steaming at 0.5 kg for 36 min. When miso was manufd. with the steamed or boiled soybean, aging after 30 days was slowest with steamed soybean under high pressure.
CA, V. 83, 1975: 7529b

WAKABAYASHI, A.
Rice-koji for miso manufacture. (Food Res. Inst. Niigata Prefect., Niigata, Japan). Miso No Kagaku To Gijutsu 1973, 228, 2-11 (Japan).

A review with 47 refs.
CA, V. 83, 1975: 7220u

WAKABAYASHI, A.; HOSOKAWA, H.
Soybean for miso manufacture. IV. Relation between hardening of steamed soybean and calcium. (Niigata Prefect. Food Res. Inst., Niigata, Japan). Niigata-Ken Shokuhin Kenkyusho Kenkyu Hokoku 1970, (11), 21-4 (Japan).

Soybeans were immersed in solns. of various org. acids prior to steaming. Immersion in 0.05M oxalic acid was most effective to obtain soft soybean. Immersion in solns. of EDTA or phytic acid that can bind Ca^{2+} was also effective, because free Ca^{2+} inhibited softening of soybean by steaming.
CA, V. 77, 1972: 112595u

YOKOTSUKA, T.; MOGI, T.; et al.
Soybean steaming for brewing soy or miso. (Kikkoman Shoyu Co., Ltd.) Japan. 7136.198 (Cl. C 12bx, A 231), 23 Oct 1971, Appl. 08 Feb 1966; 5 pp.

Defatted soybeans (99 kg) contg. 129 l. H_2O were steamed at > 1.8 kg/cm2 for < 10 min, e.g. 2 kg/cm2 for 5 min or 7 kg/cm2 for 15 sec, and rapidly cooled to $< 100°$ in 1-3 min; the digestibility with Aspergillus soya protease was 91.6 or 95.1%, resp., compared with 83.5% for the control (steamed at 2 kg/cm2 for 5 min and cooled in 20 min). Treatment increased the amino N of the product.
CA, V. 76, 1972: 44903v

b. Microorganism

EBINE, H.; SAKANO, K.
Mold which developed on the inner surface of plastic-packed miso. (Food Res. Inst., Tokyo). Shokuryo Kenkyusho Kenkyu Hokoku 1966, 21, 38-40 (Japan).

The mold detected on the inner surface of packed miso which was pasteurized at 55-60° showed the characteristics of Fusarium. More than 14% NaCl was necessary to prevent the mold growth on miso ext.-agar medium, and $>$0.18%. Na dehydroacetate or $>$0.03% sorbic acid on Czapek media. Heating at 60° for 10 min. suppressed the growth completely on koji ext.
CA, V. 65, 1966: 11234a

HIMENO, K.; KOIDE, I.; et al.
Brewing and reducing substances of kome-koji (mold inoculated steamed rice) for miso manufacture. (Okayama Munic. Labo. Ind., Okayama, Japan). Miso No Kagaku To Gijutsu 1973, 227, 28-31 (Japan).

There was high correlation between brewing of kome-koji and its ferricyanide reducing substance levels (r=0.826).
CA, V. 83, 1975: 176934k

HOSOKAWA, N.; TAKEUCHI, T.; et al.
Use of enzymes in miso and soy sauce brewing. I. Mame miso brewing using enzymes. Aichi-Ken Shokuhin Kogyo Shikensho Nempo 1973, 14, 50-9 (Japan).

Mame miso was manufd. using enzymes prepd. from Aspergillus oryzae, and compared to the miso prepd. by the whole koji method or the semi-koji method. The enzyme miso had the best quality of the 3 prepns. The optical concn. of enzymes for brewing was 1.2%. The protein soly. was higher in enzyme miso than in koji miso, whereas the protein hydrolysis was slightly lower in the former. Total sugars were 1-2% higher in enzyme miso than in koji miso.
CA, V. 84, 1976: 15853p

HOSOKAWA, N.; TAKEUCHI, T.; et al.
Use of enzymes in miso and soy sauce brewing. II. Mame miso brewing using enzymes. Aichi-Ken Shokuhin Kogyo Shikensho Nempo 1973, 14, 59-67 (Japan).

Mame miso manufd. by using enzyme prepn. B (crude enzymes from Aspergillus oryzae) added at 1.2% had excellent color and flavor. Increasing incubation temp. for 5 days (to inhibit activity of microorganisms) 20 or 40 days after incubation, slowed the decrease of pH during maturation. Modification of enzyme compns. or raw material treatments did not alter the pH. The total sugar content was 3% higher, and protein soly. and hydrolysis were lower, compared to mame miso produced by the koji method.
CA, V. 84, 1976: 15854q

HOSOKAWA, N.; TAKEUCHI, T.; et al.
Use of enzymes in miso and soy sauce brewing. III. Mame miso brewing using enzymes. Aichi-Ken Shokuhin Kogyo Shikensho Nempo 1973, 14, 68-75 (Japan).

Mame miso manuf. using 1.2% enzyme prepn. B (crude enzymes from Aspergillus oryzae) was tested in pilot plants and compared to the whole koji method and the semi-koji method. Protein hydrolysis (esp. free glutamic acid formation) was lower in the enzyme method than in the whole koji method. The amylose potency was higher in the enzyme miso than in the koji miso, and as the result sugar contents were higher in the former. Decreases in pH, contents of volatile org. acids, and increases in acid value were similar.
CA, V. 84, 1976: 15855r

ISECHI, H.
Brewing of a sweet miso by a liquid koji. (Sagakenritsu Agr. High School, Kanzaki, Japan). Nippon Shokuhin Kogyo Gakkaishi 1963, 10(8), 331-4 (Japan).

A liquid koji had insufficient proteinase activity and could not be used for making sweet miso (a sweet fermented soybean paste) unless supplemented with a solid koji or bacterial proteinase. When sweet miso was made of 80% boiled soybean and 20% rice koji, 75% of the koji could be replaced by a liquid koji. Therefore, a powdered rice or a white rice bran, which is not used for making a solid koji, could be used for making a liquid koji for brewing a sweet miso.
CA, V. 63, 1965: 1148c

ISHII, R.; IWAGAKI, C.
Manufacture of carotene-fortified foods by Neurospora sitophila. VIII. The cause and the prevention of carotene destruction in miso (soybean paste) brewing. (Osaka Munic. Hyg. Lab.). J. Fermentation Technol. (Japan) 1954, 32, 238-43; cf. C.A. 48, 4715i.

During initial ripening of miso brewed from fresh soybean with addn. of N. sitophila conidia the carotene content decreased by 2.6%; in that prepd. from defatted soybean with the same addn., carotene decreased by 57%. It is suggested that the unsatd. acids in soybean are autoxidized or oxidized by lipoxidase to conjugated diene peroxides, which oxidized carotene. Heat-treatment inactivates more lipoxidase in fresh than in defatted soybean, and boiling very fresh soybean for 3 hrs. prevents destruction of carotene completely. With decrease of the freshness the effect of the heat-treatment on stabilization of carotene decreases. Defatted soybean contains almost the same amt. of free acid as does fresh soybean, and it usually has considerable rancidity, which labilizes carotene. Soaking soybean in 0.05% alkali hydroxide prevented the destruction of carotene; KOH was more effective than NaOH. In miso brewing the lipoxidase of koji (Aspergillus molds) also destroyed carotene.

IX. The carotene increase and its cause in miso brewing. J. Fermentation Technol. (Japan) 1954, 32, 279-84.

In miso brewing with addn. of N. sitophila conidia, carotene decreases, then increases markedly in the mash. Propagation of koji and fermentation are responsible for this increase. The increase is smaller on addn. of Ca to the mash. When fresh soybean is brewed without Ca salt, the changes in carotene, lycopine, and carotenoid fractions are parallel; in the usual mashes with addn. of Ca salt, the changes in the carotene fractio are the reverse of the changes in the lycopine fraction. Boiling soybeans under 8 lb./sq. in. for 1.5 hrs. before brewing decreases the initial decrease of carotene to 5-7%.
CA, V. 49, 1955: 2022e

IWAMURA, I.
Biochemical studies on "miso", a fermented soybean paste. III. Effect of cystine on the nutritive value of "miso" protein when albino rats were fed "miso" as a supplement to rice. Bull. Agr. Chem. Soc. Japan 1935, 11, 128-34; cf. C.A. 29, 31061.

The cysteine content of "miso" protein is too low to permit growth of rats. When 0.1% cysteine was added to the diet of young rats, the nutritive value of "miso" protein was markedly increased. The addn. of 0.5-1.0% retarded growth and produced an acute nephrosis or hypertrophy of the kidney. In adult rats over 0.5% of cystine showed a favorable effect upon growth without any noxious effects. The ratio of the wt. of the kidney to the body wt. was nearly proportional to the amt. of cystine administrated.
CA, V. 30, 1936: 2614^3

IWAMURA, I.
Biochemical studies on "miso". IV. Effect of cystine upon the nutritive value of miso protein when fed to albino rats as a supplement to rice. Bull. Agr. Chem. Soc. Japan 1936, 12, 78-88; cf. C.A. 30, 2614^3.

There were 45.4-93.4 mg. of cystine in 100 g. of the fresh miso. The cystine contents of 100 g. of polished rice and soybean were, resp., 37.8-55.2 mg. and 271.5 mg. The diet consisting of polished rice and miso was too deficient in cystine to produce growth of albino rats. The cystine values of the urine, the kidney and the liver were increased by the administration of cystine. An animal fed on a 0.1% cystine diet was approx. normal. Excretion of cystine by the animal fed on a 1% cystine diet was 4.5 mg. per day.
CA, V. 30, 1936: 7153^8

KAWAMURA, T.; MIURA, M.
The effectiveness of some fungicides on miso. Fukuoka-ken Fukuoka Kogyo Shikenjo Nempo 1955-56, 24-5(Pub. 1957).

Na-dehydroacetic acid, Z-furan(5-nitro-2-furylacrylamide), and vitamin K_3 were tested as fungicides for miso. Vitamin K_3 was

most effective, but the color tone of miso became darker by its addn.
CA, V. 55, 1961: 833g

KITAOKA, K.
Soybean miso manufacturing with enzyme preparations. (Mieken Jozo Shikensho, Tsu, Japan). Miso No Kagaku To Gijutsu 1972, (218), 19-24 (Japan).

Com. enzyme prepns., including mold and bacteria proteinases, were used for manuf. of soybean miso. The amt. of the enzyme prepn. was calcd. so as to give an activity at pH 7 equiv. to that of soybean-koji. Cooked soybeans, 51 kg, were mixed with 5.2 kg salt and 1.4 l. H_2O in which the enzyme prepns. were dissolved. Fermn. lasted 90 days at 30° and then another 30 days at room temp. There was no significant difference of H_2O-sol. N, total sugar, and pH between the enzyme miso and the control. Formol-N, reducing sugars, and titrable acidity of the enzyme miso were lower than in the control. The amt. of free amino acids (except lysine, argine, serine, and tyrosine) in the enzyme miso was lower than in the control. The flavor of the enzyme miso was rather flat and unbalanced, esp. in miso soup.
CA, V. 80, 1974: 81090f

MATSUMOTO, I.; IMAI, S.
Promotion of miso fermentation. II. Addition test of Saccharomyces rouxii S96. (Food Res. Inst. Niigata, Kamo, Japan). Nippon Jozo Kyokai Zasshi 1974, 69(9), 590-4 (Japan).

S. rouxii S96, a new isolate, can grow in miso at 38-40°. It grew well in miso at the maturation temp. of 30° and produced EtOH, MeCHO, isoamyl alc., iso-PrOH, and succinic acid, which are all related to miso flavor.
CA, V. 82, 1975: 123564n

MOGI, M.; KASHIMA, H.; et al.
Miso koji. V. Brewing trials of miso by the addition of enzyme preparations. (Inst. Sci. Res., Noda, Japan). Nippon Jozo Kyokai Zasshi 1963, 58(8), 749-56 (Japan); cf. CA. 51, 18101i

Brewing trials of miso (Soybean paste) were made, in which protease (I) and amylase (II) activities of the koji were enriched by addn. of enzyme prepns., in order to study effects of these enzymes in the process of manuf. on the quality of products. Amino N, and H_2O-sol. extractibles were increased by addn. of I, and it was possible by the use of I to mature the quick-maturing miso in 2 weeks, and natural miso in 2 months, resp. These effects were marked by adding I and II prepns. simultaneously to the mash. The quality of miso was improved remarkedly by the addn. of enzymes, and the color of the products was promoted in proportion to the amt. of I added.
Ca, V. 63, 1965: 10630e

NAMIKI, M.; OKAZAWA, Y.; et al.

Gamma irradiation of miso and soy sauce. I. Radiation effects on "waki" of miso. (Inst. Phys. Chem. Res., Tokyo). Nippon Nogeikagaku Kaishi 1961, 35, 528-33

Miso, which is fermented soybean paste contg. 5.8-15.2% NaCl, generated gas during storage at 30-2°, and this phenomenon, the so-called "waki," was disadvantageous for com. packing with plastic films. By γ - irradiation, gas generation from a sample contg. 5.8% NaCl and 25.4% total sugar was suppressed to 7-8ml./g., after 6 days, about 50% of an unirradiated control, with a dose of 5×10^5 r., and to less than one-third with a dose of 10^6 r. In the case of samples contg. 13.3-15.2% NaCl, which generated 2-5 ml./g. gas after 40 days, gas generation was reduced by half with a dose of 2.5×10^5 r., and almost completely prevented by 5×10^5 r. Combined effect of irradiation and heating (60°, 10 min.) on miso was additive but not synergistic. Gas generated from miso was analyzed by infrared analysis and gas chromatography. The mixt. consisted of $> 99.5\%$ CO_2 and a small amt. of EtOH. No difference in the compn. of the gas mixt. was observed between irradiated and unirradiated samples. "Waki" is considered to be caused mainly by alc. fermentation with yeasts.

II. Radiation effects microorganisms. Nippon Nogeikagaku Kaishi 1961, 35, 533-40

Radiation effects on microorganisms in miso and soy sauce were investigated with yeasts, acrobic, and anaerobic bacteria. Microorganisms in these foods were somewhat radio-resistant, although 6% and 17% NaCl were contained in miso and soy sauce, resp. Doses for 1% survival were $5 \times 10^5 - 1 \times 10^6$ r. with microorganisms in miso, and 1.2×10^5 r with yeasts in soy sauce. The growth of putrefactive yeasts on the surface of soy sauce was inhibited for 1-2 weeks at 30° by $4.5 \times 10^3 - 1.2 \times 10^5$ r., but irradiation was not so effective as heating at 60° for 15 min.
Ca, V. 60, 1964: 4692 def

OGURA, M.

Miso brewing experiment. I. Effect of enzyme for candied white miso. (Kagawa Prefect. Ferment. Food Exp. Stn., Uchinomi, Japan). Kagawa-Ken Hakko Shokuhin Shikenjo Hokoku 1972, 64, 25-31 (Japan).

Candied white miso was exptl. brewed from rice 690, soybean 300, and NaCl 75 g. The rice was steamed and the product was utilized for koji and brewed with other raw materials for a day at 50° and then for a month at 15° with a saccharifying amylase prepn. from Rhizopus delemar. Rice koji had both liquefying and saccharifying amylase of 560 and 120 units/g., resp., and protease of 61 and 8 units/g., at pH 3 and 7 resp. Miso manufd. without the enzyme prepn. had a low content of formol N and low titratable acidity. About 40% substitution of the rice koji by the enzyme prepn. was acceptable.
Ca, V. 80, 1974: 25894j

OGURA, M.; HIRACHI, Y.

Miso brewing experiment. II. Application of a commercial koji enzyme preparation to aka-miso manufacturing. (Kagawa Pref. Res. Cent. Fermented Foods, Takamatsu, Japan). Miso No Kagaku To Gijutsu 1973, 235, 25-31 (Japan). Cf. CA 80; 25894j.

Koji was replaced at various ratios with a commercial enzyme prepn. obtained from Aspergillus oryzae. Based on sensory tests and chem. analyses, replacing less than half of the koji with the enzyme prepn. was recommended.
Ca, V. 81, 1974: 7553e

OONISHI, K.

Koji making for miso manufacture (Takeya Co., Ltd.) Japan. Kokai 76 22,889 (Cl. C12G, A23L), 23 Feb. 1976. Appl. 74 91,385, 09 Aug 1974; 2 pp.

Cereal α form starch [9005-25-8] was mixed with concd. soybean cooking juice to 30-40% water content, crushed, and inoculated with spores of Aspergillus oryzae to make koji for miso manuf. Raw starchy material, such as rice or wheat flour, was mixed with concd. soybean cooking juice to 30-40% water content, crushed or shaped, steamed, and inoculated with spores of A. oryzae to make the koji. The resulting koji had high alk. protease activity, contained lactic acid, alc., esters, vitamins, and peptides and the protease produced had high heat stability and wide activity pH range. Miso made of the koji was superior in flavor and matured in a comparatively short period.
Ca, V. 85, 1976: 4086k

SAITO, Y.; ITO, K.; et al.

Miso manufacturing using enzymic preparations. (Dep. Food Sci., Aizuwakamatsu Ind. Res. Inst. Fukushima Prefect., Fukushima, Japan). Miso No Kagaku To Gijutsu 1973, 236, 20-30 (Japan).

In miso manuf., the use of enzymic prepns., esp. proteases, in addn. to decreased amts. of koji brought about a considerable redn. in aging time.

CA, V. 82, 1976: 169030p

SMITH, A.K.; HESSELTINE, C.W.; et al.

Miso. (to U.S. Dept. of Agriculture). U.S. 2,967,108, Jan. 3, 1961.

Soybean grits and rice are treated to produce a fermented edible food, miso, which has a pleasing taste, odor, and color and increased nutritive value. The mixt. of ingredients varies depending on the type of miso desired. In making the miso, mold rice 40-50, soybeans 40-60, and NaCl 10-14% are added. Osmophillic Saccharomyces spp. capable of functioning in high NaCl concns., at temps. up to 40°, and under anaerobic conditions are used. Thus, soybeans of the Hawkeye variety are crushed by a roller-type crusher into grits (that part of the soybean free from hulls is referred to as grits.); and sized with a sieve which has a 11/64-in. round hole and a 4 x 22-in. slot. Course grits ferment better than finely

divided ones. The grits are soaked in tap water of 1 hr. and 40 min., and the excess H_2O is drained off. Max. H_2O absorption occurs within 2 hrs. and 20 min. regardless of the grit size. Approx. 11,849 g. wet grits, cooked with steam at 7 lb. pressure for 1 hr., yields 10,917 g. grits with a moisture content of 59.3%. They are soft, uniform in texture, yellow in color, and pleasing in appearance. The color becomes darker if the cooking proceeds for 90 min. Then 1000 g. of the cooked grits is mixed with 370 g. Aspergillus oryzae mold rice, 200 g. NaCl, and 70 ml. tap water and inoculated with 30 g. of good miso from a previous fermentation which contains S. rouxii (NRRL Y-2547 and Y-2548). The well-mixed material is then packed tightly into closed fermentation vessels. Waxed paper or other nontoxic films are placed over the fermenting rice and soybean grits to prevent growth of undesirable organisms on the surface of the substrate. The fermentation process is allowed to proceed for 7 days at 28° and then kept for 2 months at 35°. No aeration is supplied. Fermentation is complete at the end of 2 months, and the miso is aged for 2 weeks at room temp. The miso is ground into a thick paste and gives a product with excellent appearance, flavor, and odor. This new manufg. process has the following advantages over previous methods: there are no insol. fragments of hulls in the product, the product is more uniform in color and consistency, the manufg. time and operating expense are decreased, bad tastes and odors assocd. with typical miso fermentations are eliminated, and the protein content is higher. Lactic bacteria are not necessary for the prepn. of miso, and the yeasts alone are responsible for developing a specifically demanded flavor. Also, the removal of the soybean hulls prior to fermentation greatly accelerates the fermentation.
Ca, V. 55, 1961: 9718h

TAKAHASHI, S.; IWABUCHI, T.
Brewing of Sendai miso (fermented soybean paste) using enzymes. (Miyagi Prefect. Agric. Junior Coll., Sendai, Japan). Miso No Kagaku To Gijutsu 1974, 244, 25-32 (Japan).

Enzyme prepn. for miso brewing (detail not given) could be substituted for a part of koji.
CA, V. 82, 1975: 169029v

TAKEUCHI, T.; YOSHII, H.
Peptides in miso and soy sauce. III. Changes in the amounts of peptides during miso ripening. (Food Res. Inst. Aichi; Prefect., Nagoya, Japan). Hakko Kogaku Zasshi 1966, 44 (12), 934-9 (Japan).

The hydrolysis of soybean protein during miso ripening was studied by ion exchange. Most of the nitrogeneous compds. were amino acids and lower peptides consisting of less than 5 amino acids through all stages because of early stage hydrolysis. This early stage hydrolysis would be a characteristic property of Aspergillus oryzae.
CA, V. 69, 1968: 34775w

TAKEUCHI, T.; YOSHII, T.; et al.

Peptides in miso and soy sauce. IV. Relation between the C/N ratio of the raw materials and the distribution patterns of peptides in miso. (Food Res. Inst. Aichi Prefect., Nagoya, Japan). Hakko Kogaku Zasshi 1967, 45(1), 29-33 (Japan).

The distributive patterns of peptides as affected by protease compn. and activity resulting from the differences in the C/N ratio of the raw materials are studied. Soybean koji (low C/N ratio) contained more amino acids and peptides than any other koji of higher C/N ratio. This tendency seemed to have originated from the proteolytic character of soybean koji, because the neutral and alkali protease of Aspergillus oryzae (principal protease in soybean koji) would be more active in soybean protein than in acid protease. In the ripened miso the same distributive pattern of peptides was observed regardless of C/N ratio of raw materials. The peptide patterns may be virtually similar for all types of miso. The mol. size of the principle peptides was $<$5 amino acids in length in each type of koji and miso. The protease in A. oryzae probably has a broad specificity for soybean protein.
CA, V. 69, 1968: 9727z

TAKEUCHI, T.; YOSHII, H.

Peptides in miso and soy sauce. V. Relation between the amino acid composition of miso peptides and C/N ratio of the raw materials. (Food Res. Inst. Aichi Prefect., Nagoya, Japan). Hakko Kogaku Zasshi 1967, 45(1), 34-9(Japan).

The main amino acids contained in peptides were as follows : in miso A (soybean) aspartic acid (I), glutamic acid (II), glycine (III), proline (IV), lysine (V), threonine (VI); in miso B (Sendai) I, II, VI, III, valine (VII), leucine (VIII); in miso C (Shiro) I, II, III, VII, VI, serine (IX). Several amino acids were resistant to the action of peptidase and had a tendency to remain as peptide residues in miso: in miso A I, II, IV, V, VI; in miso B VI, I, III, VII, isoleucine; in miso C VII, I, III, VII, IX. The acidic peptides contg. I, II, and III were probably the principal peptides in miso. In detail, IV and V were usually abundant in the peptides of soybean miso and VI and VII were abundant in the peptides of Sendai and Shiro type miso. These variations might be attributed to the characteristics of koji protease influenced from the C/N ratio of the raw materials.
Ca, V. 69, 1968: 9728a

YOSHII, H.

Microorganisms in miso (soybean paste) and shoyu (soybean sauce) brewing. (Food Res. Inst. Aiche prefect., Nagoya, Japan). Kagaku To Seibutsu 1970, 8(11), 674-81 (Japan).

A review with 41 refs. Included are the kinds and functions of microorganisms such as Aspergillus oryzae and A. soyae, Streptococcus faecalis, Pediococcus holophilus, Micrococcus epidermidis /Staphylococcus epidermidis/ Bacillus subtilis, Clostridium species, and Saccharomyces rouxii in miso and shoyu

brewing, the change of microflora during koji making in relation to moisture content and C/N ratio of the substrates, temp., air supply, and original counts of microflora the relation between microflora during brewing and NaCl concn., pH, and moisture content of the brewed mash, the ratio of raw materials, the growth promoting factors for NaCl tolerant microorganisms, and temp., and fragrant components produced by the microorganisms.
Ca, V. 75, 1971: 33876s

YOSHII, H.
Miso production using enzyme agents. (Aichi Ken Shokuhin Kogyo, Shikenjo, Japan). Shokuhin Kogyo 1974, 17(16), 50-5 (Japan).

A review with 44 refs. on miso prodn. using protease and amylase.
CA, V. 81, 1974: 167878b

c. Fermentation Studies

HOMMA, N.; AKETAGAWA, T.
The carbohydrates in fermented soybean (miso). I. Detection of polysaccharides. (Guidance Sta. Agr. Product Ind., Niigata). J. Fermentation Technol. 1955, 33, 490-3 (Japan).

Fermented soybean (miso) was made from 100 parts soybean, 50 rice, 50 NaCl, and 25 water and aged for 6 months. It contained 55.80% moisture, 1.88 total N, 1.15 sol. N, 0.49 amine N, 0.06 acid (as succinic), 11.50 total sugar, 10.00 sol. sugar, 6.50 reducing sugar, and 14.83 NaCl; the pH was 5.67. It was fractionated by extn. with water and various concns. of EtOH into 8 fractions, and each fraction was hydrolyzed with H_2SO_4 and submitted to paper chromatography. The constituent carbohydrates identified were xylose, arabinose, fructose, glucose, and galactose either free or from the low mol.-wt. fraction; rhamnose, xylose, arabinose, fructose, mannose, glucose, galactose, and uronic acid from water-sol. polysaccharide fractions; rhamnose, xylose, arabinose, glucose, and fructose from possibly glycosides; and ribose, deoxyribose, glucose, xylose, and arabinose as hemicellulose constituents.

II. Detection and determination of the free sugars. J. Fermentation Technol. (Japan), 1955, 33, 516-22.

Fermented soybean was extd. with 4 vols. of water in a boiling water bath for 15 min. and then at room temp. with shaking for 90 min., treated with anion and cation exchangers, and after concn. to a small vol. submitted to paper chromatography to find many free mono- and oligo- saccharides. The sugars identified were arabinose, xylose, glucose, fructose, galactose, sakebiose, kojibiose, isomaltose, melibiose, panose, dextrantriose, manninotriose possibly derived from stachyose, and a glucotetraose. Aq. ext. of fermented soybean was deproteinized, treated with ion exchangers, and multideveloped on paper strip; sepd. sugars

were extd. at each spot with water and detd. by the method of Somogyi. The contents of free sugars in the fermented soybean were: xylose 0,16, arabinose and fructose 0.20, glucose and galactose 5.30, sakebiose and kojibiose 0.10, isomaltose 0.54, melibiose 0.34, panose 0,08, dextrantriose 0,16, manninotriose 0.28, and dextrine 0,26%.
CA, V. 50, 1956: 7390h

KAWAKISHI, S.; HIRANO, S.; et al.
Precipitation of some amino acids in crystalline form in the process of miso fermentation. (Aichi Inst. Food Technol., Nagoya). Nippon Nogeikagaku Kaishi 1959, 33, 1130-3.

White granulous material was pptd. in cryst. form during miso production. By paper chromatography, leucine (I), isoleucine (II), valine, alanine, glycine, tyrosine, histidine, and an unidentified amino acid were detected in the ppt. I and II were 60-70% of the total amino acids in the ppt. The amt. of tyrosine, histidine, and an unidentified amino acid was so small that their presence was doubted.
CA, V. 58, 1963: 2781f

MATSUMOTO, K.; OKUDA, S.
Quick brewing of miso with addition of lactic and succinic acids. (Govt. Inst. Brewing, Tokyo). J. Soc. Brewing 1953, 48, 31-5 (Japan).

Lactic (I) and succinic (II) acids were added separately to soybean paste at 4 different levels (I 0.02-0.2%, II 0.005-0.05%) The pastes were fermented and chem. compn. and taste were detd. for each lot of pastes at 20 and 30 days of fermentation. No significant differences were observed among the lots in chem. compn., but considerable difference was noted in taste. At 20 days of fermentation the miso with I was better in taste than with II, while at 30 days the miso with II was generally better than with I. Addn. of 0.01% II resulted in the best product.
CA, V. 49, 1955: 5765h

MOGI, M.
Miso and soy sauce. Amino acid fermentation and nucleic acid-related substances. (Noda Soy Sauce Co., Noda, Japan). Nippon Jozo Kyokai Zasshi 1963, 58(3), 285-302.

A review with 352 references.
CA, V. 61, 1964: 4876c

OGATA, M.

Preventing fermentation in miso making. (Kumamoto Ind. Res. Inst., Japan). Nippon Jozo Kyokai Zasshi 1962, 57(7), 624-9.

Several agents were applied singly or in combination to miso (soybean paste) for preventing fermentation (gas formation) in the process of miso making, and their effects on prolonging the time before fermentation were examd. The miso packed in a sealed bag could be stored at 27° for 30 days without fermentation by

the addn. of propylene glycol 2%, and Na dehydroacetate 0.02%, followed by heating at 60° for 2 min.
CA, V. 61, 1964: 4876b

SHIBASAKI, K.; HESSELTINE, C.W.
Miso fermentation. (U.S. Dept. of Agr., Peoria, Ill.). Econ Botany 1962, 16, 180-95; cf. CA 56, 15884c.

Prepn. of miso, a fermented mixt. of rice, soybean, and NaCl, is described. Miso (6 types) showed H_2O 48.2-52.3, protein 8.3-23.5, crude fat 1.6-10.5, carbohydrates of 6.4-30.1, NaCl 4.0-12.8, amino N 0.2-0.8, and crude fiber 1.6-4.0 %. Among the usual 17 amino acids present cystine was low and leucine and isoleucine were high.
CA, V. 58, 1963: 1859f

d. Nutritive Values

AMANO, T.; NANBA, T.
Aroma in soybean miso and Tamari soysauce. III. Composition of aroma-concentrated solutions produced from soybean miso. (Food Res. Inst., Japan). Aichi-Ken Shokuhin Kogyo Shikensho Nempo. 1972, 13, 43-51 (Japan).

The compn. of an aroma conc. produced from soybean miso was detd. by gas chromatog., and by thin-layer chromatog. Of 72 gas-chromatog. peaks obtained, 7 were alcs., 8 were esters, 16 were org. acids, and the highest peak was acetic acid [64-19-7]. The trapped pool from peaks 1-17 (fraction I) had an ester-like odor, that from peaks 18-26 (fraction II) had an acidic odor, and that from peaks 27-44 (fraction III). that from peaks 45-57 (fraction IV) and that from peaks 58-72 (fraction V) had a grassy odor. The odor intensity was II > III > I > IV > V. MeOH [67-56-1], EtOH [64-17-5], PrOH [71-23-8]. BuOH [71-36-3] and amyl. alc. [71-41-0] were detected by silica-gel thin-layer chromatog. after converting to the 3,5-dinitrobenzoates.
Ca, V. 84, 1976: 29388c

EBINE, H.
Components of miso. I. Nitrogenous components. (Food Res. Inst., Min. Agr. and Forest., Tokyo, Japan). Nippon Jozo Kyokai Zasshi 1967, 62(11), 1210-14 (Japan).

Studies on proteins, peptides, amino acids, and org. bases in miso and its raw materials, soybeans, rice, and barley, were reviewed. Their changes during miso processing were also described.
CA, V. 68, 1968: 67767c

EBINE, H.
Components of miso. II. Carbohydrates, organic acids, and other components. (Food Res. Inst., Min. Agr. and Forest.,

Tokyo, Japan). Nippon Jozo Kyokai Zasshi 1967, 62(12), 1368-73 (Japan).

A review on carbohydrates, lipids, org. acids, vitamins, and other components in miso, and its raw materials. 57 references.
CA, V. 68, 1968: 67768d

EBINE, H
Manufacturing digestible proteinous foods from oilseeds and pulses by enzymic treatment. Jarq Japan Agr. Res. Quart. 1966, 1 (1), 21-5.

The method commonly used in Japan for making miso, a highly nutritious and digestible protein food derived from soya beans, is described. The fermentation and ripening processes involved take 6 months or more; the time of ripening could, however, be considerably reduced by raising the temperature to 45°C, and by introducing a 2nd fermentation process for which certain yeasts and lactic acid bacteria are employed as a starter. Enzyme preparations made from Aspergillus oryzae are used for the production of a new type of miso of low salt and high protein content. Seeds of Cicer arietinum and split pigeon peas proved suitable for making a digestible protein food along the lines used for miso making. The employment of an acid proteinase proved advantageous for the hydrolyzation of protein from pulses and beans. Tables. 3 refs.
Royal Tropical Institute, Amsterdam q2264.

EBINE, H.; SHIMOKAWA, M.; et al.
Application of tocopherols as antibrowning agent of miso. (Food Res. Inst., Tokyo). Shokuryo Kenkyusho Kenkyu Hokoku 1965, 19, 151-3 (Japan).

Tocopherol prepd. from soybean oil, consisting of α-, γ-, and δ-tocopherols (10, 65, 25%, resp.) was dissolved in propylene glycol and added at the level of 0.1% to green miso before ripening. The treatment effectively reduced browning of finished miso without any unfavorable effect on its quality.
CA, V. 64, 1966: 1268b

EBINE, H.; SASAKI, H.
The effect of sorbic acid as a preservative of miso. I. Determination of sorbic acid in miso. (Food Res. Inst., Tokyo). Shokuryo Kenkyusho Kenkyu Hokoku 1966, 21, 35-7 (Japan).

Spectrophotometric detn. of sorbic acid cannot be applied to miso which contains significant amts. of 5-hydroxymethylfurfural. Thus, applicability of the thiobarbituric acid (I) method (Nury and Bolin, CA 60, 3417d) and the conditions of making an ext. for the color reaction with I were examd. with salty-type miso, to which 0.05-0.10% K sorbate had been added. Good recovery was obtained with the following procedure : ten ml. of 4% aq. ext. of miso is shaken with 2.2 ml. of N HCl and 10 ml. Et_2O, and the aq. layer discarded. The remainder is shaken with 10 ml. 0.1 N NaOH after washing with a small amt. of water, and the Et_2O layer

is discarded. The remaining alk. soln. is dild. to 100 ml., and 2 ml. of it is used for reaction with I.
CA, V. 65, 1966: 11233g

HARASAWA, H.; AKITAGAWA, T.
Improvement of the quality of miso produced in Niigata Prefecture. I. Chemical composition of miso produced in Niigata Prefecture. (Guiding Sta. Farm Ind., Niigata). J. Soc. Brewing, Japan, 1953, 48, 18-24.

Moisture, crude protein, water-sol. N, amino N, water-sol, reducing sugar, water sol. total sugar, NaCl, ash, and total acid were detd. for 53 samples of miso from Niigata Prefecture (N) and 25 com. samples from other parts of Japan (J.). The results of chem. and palatability tests were discussed. The ratio of NaCl content to water-sol. reducing-sugar content was 2.0-3.0 for N. and 1.0-1.6 for J., the ratio of NaCl content to amino-N content was 20.0-22.0 for N, and 23.0 for J., and the ratio of water-sol. reducing-sugar content to amino-N content was 7.5-12.5 for N. and 12.3 for J.
CA, V. 49, 1955: 5766d

HOMMA, N.; INAKOSHI, N.; et al.
Effect of heat on the substances that have low boiling points and compose the flavor of miso-soup. (Niigata Kenritsu Joshi Tanki Daigaku, Niigata, Japan). Kaseigaku Zasshi 1973, 24(3), 177-83 (Japan).

The head space gas of unheated miso soup (fermented soybean paste) contained MeCHO, Me_2CHCHO, MeOH, EtOH, and EtOAc while that of heat-treated (10 min at 100°) miso soup had considerable amts. of isovaleraldehyde and (or) α-Me aldehydes in addn. to those mentioned above. Continued heating increased the content of aldehydes, but decreased that of the ester.
CA, V. 79, 1973: 103791u

INA, K.
Flavor of hatcho miso. II. Acidic components in hatcho miso. (Shizuoka Univ., Shizuoka, Japan). Nippon Shokuhin Kogyo Gakkai-Shi 1973, 20(2), 71-4 (Japan).

High-boiling components of the neutral fraction of hatcho miso (a kind of miso produced from soybeans without added rice). were reported to be Me esters of higher fatty acids. Acidic as well as neutral components (oils) were obtained by Et_2O extn. and acid and alkali treatment. The acidic oil was sepd. further by steam distn. and 22 fractions of volatile matter were obtained, among which identified were HOAc [64-19-7], propionic acid [79-09-4], isobutyric acid [79-31-2], butyric acid [107-92-6], isovaleric acid [503-74-2], valeric acid [109-52-4], isocaproic acid [646-07-1], caproic acid [142-62-1], enanthic acid [111-14-8], caprylic acid [124-07-2], pelargonic acid [112-05-0], and capric acid [334-48-5]. The nonvolatile matter was treated with diazomethane and was sepd. into 5 fractions by gas chromatog. They

were Me esters of palmitic /112-39-0/, stearic /112-61-8/, oleic /112-62-9/, linoleic /112-63-0/ and linolenic acid /301-00-8/. The high boiling fraction of neutral oil was sepd. by steam distn. It contained 10 compds. identified as Me and Et esters of palmitic /628-97-7/, stearic /111-61-5/, oleic /111-62-6/, linoleic /544-35-4/, and linolenic acid /1191-41-9/. Identifications were made by gas chromatog., and ir, mass, and NMR spectrometries.
CA, V. 84, 1976: 42185d

ISHII, K.
Bitter taste of Hatcho-miso. I. Taste of the ether extract of Hatcho-miso. (Nippon Univ., Tokyo), Nippon Daigaku Nojuigakubu Gakujutsu Kenkyu Hokoku 1966, 23, 1-9 (Eng.).

Hatcho-miso is a kind of miso made from soybeans and soybean koji and has a bitter taste. The taste of the ether ext. was bitter and astringent. The ether ext. was fractionated into neutral, weakly acidic, and acidic fractions. The bitter and astringent taste of the ether ext. was due to phenolic compds. in the weakly acidic fraction.
CA, V. 66, 1967: 27830v

ISHII, K.; NUSHIKOSHI, S.
Separation of furfural from hatcho-miso. (Nippon Univ., Tokyo). Nippon Daigaku Nojuigakubu Gakujutsu Kenkyu Hokoku 1964, 19 1-8 (Eng.).

Hatcho-miso is a kind of miso made from soybeans with soybean koji. A 10% NaOH-insol. fraction in which furfurals were present was sepd. from the ether ext. of the sample. From this fraction, furfural (I) was isolated by distn. under reduced pressure at 40° and identified by ultraviolet absorption and paper chromatography of its 2,4-dinitrophenylhydrazone. I was deted. with m-phenylenediamine and 13 mg.% I was found in the sample. Hydroxymethylfurfural was not found although resorcinol-HCl reaction gave a faint orange-yellow coloration in the residue after distn. of I.
CA, V. 61, 1964: 16703h

ITO, H.; EBINE, H.
Hardness of miso estimated by jelly tester. (Food Res. Inst., Tokyo). Shokuryo Kenkyusho Kenkyu Hokoku 1964, 18, 43-5.

Hardness of 11 prepns. of miso (fermented soybean paste), including special ones supplemented with other protein materials such as skim milk or dry yeast, was estd. with a jelly tester. For rice miso, hardness value of 50-70 g. was regarded most suitable by the organoleptic judgement. During fermentation, the hardness decreased rapidly in the 1st week after packing into the fermentation tank. Addn. of proteinase accelerated softening. Polyphosphates were effective in making hard miso.
CA, V. 61, 1964: 13807

ITO, H., EBINE, H.;et al.
Manufacturing of miso with high protein and low salts. I.

The manufacturing process. (Food Res. Inst., Tokyo). Shokuryo Ken-kyusho Kenkyu Hokoku 1965, 19, 127-36 (Japan).

Soybean meal, defatted with hexane, was more satisfactory as a supplement at a level of 25% to fresh miso, based on flavor of the product, than soybean milk powder, dried skim milk, or dry yeast. Protease treatment of soybean meal for supplement improved the quality of the product under certain conditions.

Shokuryo Kenkyusho Kenkyu Hokoku 1965, 19, 147-50 (Japan).

Addn. of 5-ribonucleotides (I) to miso (fermented soybean paste) was investigated. More than 90% of initial I was lost in only 2 days, and no I was detected after 6 days. Heat treatment of the supplemented miso at 80° for 5 min. reduced the decompn. to only 22% of the initial level. Accompanying the rapid decompn. of I by com. enzyme prepns. from Aspergillus oryzae, one of the most important organisms for the production of miso, inorg. phosphoric acid increased. This indicated that the decompn. was due to phosphatase. Guanosine and inosine were detected in the decompd. products of I, and 3 other unidentified compds. were also found.
CA, V. 64, 1966: 1267h

ITO, H.; EBINE, H.; et al.
Manufacturing of miso with high protein and low salt. II. Preservation of miso. (Food Res. Inst., Tokyo). Shokuryo Kenkyusho Kenkyu Hokoku 1966, 21, 55-9 (Japan); cf. CA. 64, 1267h.

Raising the protein and lowering the salt level of miso is desirable for its better utilization as a protein source in the Japanese diet. However, such a product deteriorates easily by abnormal fermentation. Nitrofurazone and trimethyllauryl ammonium 2,4,5-trichlorophenate at 0.02% and sorbic acid and Na dehydroacetate at 0.2% were effective in preventing abnormal fermentation for 4 days at 30°. Na hexametaphosphate and Na tripolyphosphate both at 0.2% also suppressed the deterioration; however, they had undesirable effects on the flavor of the product.
CA, V. 65, 1966: 11234c

ITO, H.; EBINE, H.
Flavor of miso. I. Detection of flavor in head space. (Natl. Food Res. Inst., Tokyo, Japan). Miso No Kagaku To Gijutsu 1970, (191), 22-4 (Japan).

Twenty g of miso was mixed with 30 g NaCl and H_2O to 100 ml. For yeast culture, 70 ml culture media were mixed with 30 g NaCl and H_2O to 100 ml. The addn. of the salt liberated volatile substances into the head space. The sample in a 100 ml flask was covered with 4 sheets of Kureharon film, and was warmed for 35 min. at 30° or in boiling water. Flavor substances were taken with an injection syringe for gas chromatog. with polyethylene glycol (PEG 1000). When warmed at 30°, volatiles with lower bp than EtOH were successfully detected.

Volatiles with lower b.p. than iso-PrOH could be detected well by the treatment with boiling water.

Flavor of miso. II. Volatile substances of swelled miso. (Natl. Food Res. Inst., Tokyo, Japan). Miso No Kagaku To Gijutsu 1970, (191), 25-9 (Japan).

The compn. of the gas in a polyethylene bag in which miso was packaged and swelled by the action of microorganisms during storage was examd. by gas chromatog. CO_2 was the major component, followed by N_2 and O_2. CH_2O, Et formate, EtOAc, EtOH, BuOAc, Bu formate, AcH, isoamyl acetate, isoamyl alc., and Et lactate were detected. The amt. of EtOH and AcH increased remarkably when the swelling proceeded. EtOAc, isoamyl acetate, and isoamyl alc. were also high in the swelled miso.

Flavor of miso. III. Detection of an alcohol and cyclamic acid as nitrite ester. (Natl. Food Res. Inst., Tokyo, Japan). Miso No Kagaku To Gijutsu 1973, (194), 14-20 (Japan).

Five ml 10% $NaNO_3$ and 5 ml 10% $H2SO_4$ were added gradually to an ice-cooled mixt. of miso and H_2O. The reaction mixt. was allowed to stand in an ice water for 1 hr for esterification, and then shaken with 10 ml pure hexane for 3 min. The substances extd. into a gas chromatog. app. with a Simalite column. The detn. of cyclamic acid was possible by polyethylene glycol (PE G 6000). Hexyl, heptyl, octyl, and tetrahydrofuryl alcs. were detected in miso by setting the column temp. at 60°.

Flavor of miso. IV. Flavor substances of commercial miso of different varieties. (Natl. Food Res. Inst., Tokyo, Japan). Miso No Kagaku To Gijutsu 1970, (194), 14-20 (Japan).

EtOH, iso-BuOH, and iso-amyl alc. were detected in each type of miso by gas chromatog. White miso and sweet barley miso of good quality contained small amts. of volatile substances, although alcs., esters, and aldehydes increased when abnormal fermn. proceeded. Esters and EtOH in light yellow salty miso were lower, and EtOH, isoamyl alc., BuOH, iso-BuOH and isoamyl butyrate were high in red salty miso (Sado miso and Sendai miso). Soybean miso was rich in iso-BuOH but poor in iso-amyl alc.

Flavor of miso. V. Rapid gas chromatographic analysis of volatile organic acid. (Natl. Food Res. Inst., Tokyo, Japan). Miso No Kagaku To Gijutsu 1971, (208), 20-3 (Japan).

Miso was acidified with H_2SO_4 and distd. to obtain volatile org. acids which were injected into a gas chromatograph contg. Porapak Q. When 30 g. miso was employed, 100 ml of distillate was enough for 100% recovery. Formic, acetic, propionic, isobutyric, and butyric acids were detected; formic, propionic, and butyric acid were esp. high in overfermented or off-flavor miso. Acetic and butyric acids in barley miso and soybean miso increased greatly when the fermn. was abnormal.
CA, V. 80, 1974: 144488q

ITO, K.
Tasting effect of miso as a seasoning. III. Electrophoretic fractionation of the miso protein. (Tokyo Gakugei Univ., Tokyo, Japan). Eiyo To Skokuryo 1970, 23(3), 196-204 (Japan).

Fractionation of soybean proteins (I) at different stages of miso fermentation was studied by disc electrophoresis. As specimens, com. mame-miso (miso fermented without rice koji) (II), crude soybean (starting material) (III), and miso fermented with rice koji were used. Two fractions of I were sepd. from II by $(NH_4)_2SO_4$ fractionation. From water-extd. I of II, 3-7 fractions were detected by electrophoresis. From the water-extd. I of III, 12 fractions were detected, which were decompd. and transformed during the fermentation process. During the maturing process, the fraction from III corresponding to albumin increased. The buffer action of soybean was intensified by the fermentation process.
CA, V. 73, 1970: 86707c

ITO, K.
Tasting effect of miso as a seasoning. IV. Experiments on the protein of soybean fermented miso. (Tokyo Gakugei Univ., Tokyo, Japan). Eiyo To Skokuryo 1970, 23(3), 205-12 (Japan).

Water extractable protein (I) of mame-miso (II) was analyzed by by electrophoresis and gel-filtration. I had given the same migration value as that of prealbumin of bovine albumin. I was a spherocolloid, from viscosity detn. Many peptides showed proteinoid behavior. The isoelec. point of I was at pH 4.6-4.7 and 4.2-4.3 by viscosity and soly. measurement, resp.
CA, V. 73, 1970: 86708d

IWABUCHI, S.; SHIBASAKI, K.
Food chemistry of soybeans. XXIV. Aroma of miso. 2 Characterization of neutral and acidic compounds. (Tohoku Univ., Sendai, Japan). Nippon Shokuhin Kogyo Gakkai-Shi 1973, 20(2), 48-53 (Japan).

Aroma conc. was prepd. from miso by steam distn. followed by Et_2O extn. Thirty-three peaks in neutral fraction and 5 peaks in acidic fraction were detected by gas chromatog. The ir spectra of the major peaks isolated were detd. and the following compds. were identified: EtOH [64-17-5], isoamyl alc. [123-51-3], AcH [50-00-0], isovaleraldehyde [590-86-3], furfural [98-01-1], phenylacetaldehyde [122-78-1], EtOAc [141-78-6], diethyl acetal [105-57-7], AcOH [64-19-7], propionic acid [79-09-4], isobutyric acid [79-31-2], and isovaleric acid [503-74-2]. Minor unidentified peaks seemed to correspond with esters of AcOH. However, no specific aroma of miso could be detected organoleptically among the 38 compds. It was presumed that the aroma of miso was composed of many components in different proportions.
CA, V. 84, 1976: 42183b

IWASHITA, S.
Rancidity of miso. III. Compositions of the volatile acids

of rancid miso and normal miso. (Asahi Chem. Ind. Co., Tokyo). Hakko Kogaku Zasshi 1959, 37, 264-7.

Examn. of the Duclaux distn. curves of normal miso (fermented soybean paste) contg. 14% NaCl and rancid miso contg. 7% NaCl indicated that the volatile component of the former was apparently AcOH while the latter was composed of a volatile acid with low b.p. and a no. of volatile acids with relatively high b.ps.; formic acid was detected and the presence of butyric acid suggested.
CA, V. 54. 1960: 15740i

KAWAKISHI, S.; HIRANO, S.; et al.
Organic acids formed in process of miso fermentation. I. Organic acids of soybean koji. (Aichi Inst. Food Technol., Nagoya, Japan), Nippon Nogeikagaku Kaishi 1961, 35, 347-50.

Org. acid compn. of several kinds of miso was investigated by column chromatography with silica gel (Bullen, et al., Anal. Chem. 24, 187(1952). Acetic, formic, lactic, glycolic, malic, and citric acids were recovered in yields of more than 90%, and the sepn. of succinic from lactic acid was complete. In almost all kinds of miso, lactic acid (9.04-19.49 meq/100g) was the main acidic component. Citric acid (av. 12. 43 meq/100g) was the 2nd component in 2 defatted soybean-koji samples, and acetic acid (6.04 meq/100 g) the 2nd component in 5 nondefatted soybean-koji samples. Defatted soybean-koji contained more malic and citric acids and less acetic and lactic acids than nondefatted soybean-koji. The proportion of each kind of org. acid seemed to be influenced by phys. conditions, such as size, hardness, moisture, and temp. of misodama.
CA, V. 59, 1963: 15864a

KUICHI, K.; OHTA, T.; et al.
Lipids of soybean foods. I. Changes in lipid components of miso-dama koji. (Natl. Food Res. Inst., Minist. Agric. For., Tokyo, Japan). Hakko Kogaku Zasshi 1975, 53(12), 869-74 (Eng.).

The change in the lipid content of miso-dama (soybean koji for soybean miso) was investigated. The triglycerides content in soybean was 88%, and 70,6% in miso-dama. The free fatty acids content was higher in miso-dama than in soybean. Model soybean koji was made in order to investigate in detail the role of koji mold in koji prepn. The free fatty acid content increased markedly from the 2nd day to the 4th day of inoculation, while the fatty acid compn. of triglycerides remained similar to that of total lipids, and the free fatty acid compd. approached the fatty acid compd. of total lipids and triglycerides. Max. lipase /9001-62-1/ activity was obsd. on the 2 nd day of inoculation on the hull fraction of soybean with abundant growth of koji mold.
CA, V. 84, 1976: 57557a

MATSUMURO, H.; KITAGAWA, S.; et al.
Enrichment of foods. VII. Stability of vitamin A enriched to miso. Ann. Rept. Natl. Inst. Nutrition (Japan) 1954, 33-4; cf. C.A. 48, 9571i.

The effect of shikomi (process of mixing materials before fermentation) and fermentation on the stability of vitamin A (I) of enriched miso soybean paste was studied. There was no destruction of during processing when I was added to roasted soybean flour (II). Ten to 20% of I was destroyed when defatted soybeans were used in place of II. Miso is a suitable food for I enrichment
CA, V. 49, 1955: 15107f

MATSUSHITA, A.
Changes of free sugar contents during the fermentation of mugi-koji and mugi-miso. (Kumamoto Women's Coll., Kumamoto Japan). Nippon Nogei Kagaku Kaishi 1970, 44(1), 51-4 (Japan).

Free sugar contents in mold-fermented barley and fermented soybean paste during the maturation process were detd. by the glucose oxidase method and by cutting paper chromatograms and the micro-Bertrand method. During the maturation of the fermented products there was a large decrease in the amts. of oligosaccharides, particularly sucrose, which was the main sugar in steamed barley and steamed soybean, and a large increase in glucose. Fermented barley contained raffinose, stachyose, and maltose. At the last stage of the maturation process glucose was the major component of the free sugars.
CA, V. 72, 1970: 120214f

MATSUSHITA, A.; YAMADA, A.
The free amino acids found in miso and the variation of their contents in the ripening period. (Kumamoto Women's Coll.). J. Home Econ. (Japan) 1956, 7, 17-22.

Paper chromatography was used in identifying amino acids present in the exts. obtained periodically during the period of propagation of Aspergillus oryzae and the period of ripening of miso. In the propagation period, alanine, lysine, histidine, glutamic acid, glycine, tyrosine, leucine, phenyalanine, aspartic acid, methionine, tryptophan, and valine were always present; glutathione originally detected disappeared; proline, arginine, serine, threonine, cystine, asparagine, and hydroxyproline appeared later. During the ripening period, proline, leucine, glutamic acid, valine, methionine, tryptophan, asparagine, lysine, alanine, histidine, and phenylalanine were always detected; threonine, tyrosine, and aspartic acid disappeared but reappeared later; glutathionine, serine, glycine, and hydroxyproline disappeared completely; and glutamine, cystine, and one other unidentified amino acid appeared.
CA, V. 50, 1956: 14999f

MIYASAKA, S.; MATSUMOTO, Y.; et al.
Changes of temperature and chemical composition of miso manufactured by the quick-ripening method. (Miyasaka Brewing Co., Tokyo). Nippon Jozo Kyokai Zasshi (J. Soc. Brewing, Japan) 1950, 45, 411-18.

Miso manufd. from whole and defatted soybeans was analyzed for pH, total acids, amino-N, NaCl, reducing sugar, sol. N., total N, and fiber during the 3 months of ripening. The results showed, among other points, that some kinds of defatted soybeans and whole soybeans gave products of incomplete decompn. of the protein.

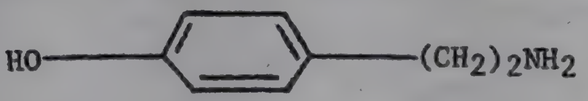
Vitamin B_1 content of Manchurian whole rice. J. Agr. Chem. Soc. Japan 1944, 20, 5-8

Thiamine content of Manchurian whole rice detd. by the chem. method of Sakurai and Inagaki (C.A. 35, 5525^8) was in the range between 82 and 378γ%. The probable values would be at 250-300γ%, which are distinctly lower than the rough av. value of 360γ% for Japanese whole rice; this difference was assumed to be caused by fertilizing conditions.
CA, V. 46, 1952: 1661h

MOCHIZUKI, T.; YASUHIRA, H.; et al.
Determination of alcohol concentration in miso using an alcohol meter. (Res. Lab. Shinshu Miso, Japan). Miso No Kagaku To Gijutsu 1974, 246, 24-7 (Japan).

A simple and accurate app. with a semi-conductor sensor for quality control of miso was developed. Alc. detn. using this app. was made by reading the meter after holding miso samples in dishes (4,2 cm x 1 cm) for 10 min. at 40°. The correlation coeff. between the values obtained by this method and those by gas-chromatog. was 98.7
CA, V. 82. 1975: 168928a

NANBA, T.; YOSHII, H.
Organic bases in miso and soy sauce. IV. Determination of tyramine in miso and soy sauce. (Japan). Aichi-Ken Shokuhin Kogyo Shikensho Nempo 1974, 15, 37-40 (Japan). Tyramine (I).



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[51-67-2] contents were detd. in miso and soy sauce by the Folin method. The samples were pretreated with weakly acidic ion-exchange resins such as Amberlite IRC-50, and sepd. by thin-layer chromatog. The sepd. fraction was read at 660 nm after treating with Folin's reagent. Thus, I contents of miso, soy sauce, and a soln. of amino acids were 1-16, 24-89.5, and 9-20 mg%, resp.
CA, V. 84, 1976: 29276q

NARAYANA RAO, N.; RAMACHANDRA RAO, T.N.
Nutritional evaluation of pre-digested protein rich foods (Miso-like products) and the effect of their supplementation to poor rice diet-III, (Central Food Technological Research Institute, Mysore). J. of Food Sci. and Tech., 1972, 9 (3), 127-128.

Pre-digested Miso-like products using a blend of groundnut flour and Bengalgram (Cicer arietinum) dhal along with either rice or corn were evaluated for their nutritive value by PER studies. The effect of supplementing them to poor rice diet was studied by rat growth experiments. A comparison was made between fermented and unfermented products by animal experiments to assess the effect of fermentation on the nutritive value.
Author.

OGATA, M.
Change of amino acids in miso by heat treatment. (Fukuokaken Kogyoshikensho, Fukuoka, Japan). Miso No Kagaku To Gijutsu 1972, (219), 26-7 (Japan).

Rice miso ripened at 30° for 10 days was pasteurized at 55° through a steam-jacketed chopper. By this treatment, the amt. of amino acids was increased to 107%; lysine, threonine, proline, phenyl-alanine, asparagine, and glutamic acid increased, and arginine, leucine, serine, valine, and methionine decreased. When 10% miso soln., was boiled for 10 min, the amt. of amino acid was increased to 116 and 128% for raw miso and pasteurized miso, resp. Arginine, glutamic acid, proline, serine, asparagine, lysine, alanine, isoleucine, valine, threonine, phenylalanine, and glycine increased, and leucine, methionine, and histidine decreased by boiling miso in water.
CA, V. 80, 1974: 81092h

OGATA, M.
Prevention of the browning of miso (fermented soybean paste) by aluminum phytate. (Ind. Res. Inst. Fukuoka Prefect., Fukuoka, Japan). Miso No Kagaku To Gijutsu 1974, 245, 27-9 (Japan).

Al phytate ($C_6H_{12}O_{20}P_6Al_6$) (I) prevented the browning reaction between amino acids and glucose, and at $>$ 0.01% in miso resulted in promotion of ripening and prevention of browning.
CA, V. 82, 1975: 169028u

OKAMOTO, T.
Low boiling point aroma compounds in miso (soybean paste). (Kawaga Prefect. Ferment. Food Exp. Stn., Uchinomi, Japan). Kagawa-Ken Hakko Shokuhin Shikenjo Hokoku 1969, No. 61, 39-43 (Japan).

Eight samples of miso were analyzed by gas chromatog. for their aroma compds. in head space vapor and ether ext. of steam distillate. Sixteen peaks were found in head space vapor and Me_2S, AcH, EtCHO, isobutyraldehyde, EtOAc, isovaleraldehyde, and EtOH were identified by retention time and elimination of peaks by reaction of head space vapor with several reagents. Alcs. of C_2-C_5 were found in the ether ext. Among isolated peaks, the area of the EtOH peak was 55-89% of total area. The amt. of aroma compds. in brown miso was far more abundant than that of white miso.
CA, V. 74, 1971: 30867h

SAKURAI, Y.

Chemical constituents of "miso" (the bean paste), a common Japanese food. I. Fat and oil. J. Agr. Chem. Soc. Japan 1932, 8, 1312-13.

Three kinds of miso oil were compared with that of soybean (the material). Miso oil is rich in free fatty acids and the quantity of unsatd. acids is nearly equal to that of the soybean oil. The increase of lower fatty acids was remarkable in miso. Phytosterol was isolated from the unsaponifiable part of the miso oil.
CA, V. 27, 1933: 1058

SAKURAI, Y.

The chemical compositions of "miso" a Japanese food. II. Organic bases in "Sendai-miso". J. Agr., Chem. Soc., Japan 1933, 9, 347-51; cf, C.A. 27, 1058.

Hypoxanthine (picrate) 1.1., histamine (picrate) 0.8, arginine (picrate) 5.7., lysine (picrate) 5.5., choline (picrate) 1.0 and histidine (?) (HCl salt) 0.4 g. were isolated and identified from 8.5 kg, of the samples.
CA, V. 27, 1933: 3756

SAKURAI, Y.

Chemical constituents of "miso", a Japanese food. III. Free fatty acids and saponin. J. Agr. Chem. Soc. Japan 1933, 9, 1326-30; cf. C.A. 27, 3756

Oleic, linoleic, linolenic, stearic and palmitic acids were found in a free state in miso. The existence of arachidic acid was suspected. Four g. of. a Ca salt os saponin, m. 264-6°, was isolated from 9 kg of "miso". Free saponin, m. 232°, was sepd. by H_2SO_4. It was identified with soybean saponin.
CA, V. 28, 1934: 2421^5

SAKURAI, Y.

Chemical constituents of "miso". IV. Acids. J. Agr. Chem. Soc. Japan 1934, 10, 486-95; cf. C.A. 28, 2421^5.

The juice of "miso" has pH 5-6. Total acidity of "miso" is 1.2-1.5% (as lactic acid) and the content of volatile acid is 0.04-0.08% (as AcOH). AcOH lactic acid and little succinic acid were isolated and identified. The quantity of free ethersol, acid was only 0.03-0.1%. P in the ether-insol. part consisted mostly of inorg. phosphate and a trace of phosphoric acid. Hence the acidity may be mainly due to acidic phosphates.
CA, V. 28, 1934: 5548^4

SAKURAI, Y.

The composition of "miso" (bean paste), a Japanese common food. Preliminary note. J. Agr. Chem. Soc. Japan 1933, 9, 5-6; cf. C.A. 27, 1058

The changes of the N distribution, the sugar and the free acid during the fermentation were investigated.
CA, V. 27, 1933: 2223

SASAKI, H.; MATSUSHITA, Z.
Flavor of miso. I. Volatiles in miso of excellent quality. (Cent. Miso Inst., Tokyo, Japan). Miso No Kagaku To Gijutsu 1970, (200), 40-5(Japan).

Six samples of miso evaluated as the best in each variety by a well trained panel were used. The amt. of volatiles in white miso was very small. EtOH and AcH were dominant in light yellow salty miso. EtOH, AcH, isobutyraldehyde, iso-BuOH, and isoamyl alc. were the principal volatiles of red salty miso. The amt. of volatiles in barley miso was as great as in red salty miso; the sweet type was rich in butyraldehyde, EtOH, and amyl alc., and the salty type in isoamyl alc.
CA, V. 80, 1974: 144489r

SASAKI, H.; MATSUSHITA, Z.
Flavors of miso. II. Volatiles of miso and their relation to the organoleptic evaluation of miso. (Cent. Miso Inst., Tokyo, Japan). Miso No Kagaku To Gijutsu 1971, (209), 19-23(Japan).

Among the miso exhibited in the Japan Miso Exhibition, miso of high score and low score as the result of organoleptic tests were used. Volatiles in white miso, edo-miso, and light yellow sweet type miso were comparatively low. Light yellow salty miso, which was highly evaluated, was rich in AcH and EtOH followed by iso-BuOH and isoamyl alc. Red salty miso which was highly evaluated had more volatiles than light yellow salty miso, esp. in the amt. of EtOAc. Soybean miso evaluated as having good flavor had low volatiles. Barley miso evaluated as having good flavor had high volatiles, esp. isoamyl alc., and EtOH was high n well ripened miso. When AcH was added to light yellow sweet miso, good flavor resulted. EtOH also gave a favorable flavor.
CA, V. 80, 1974: 144490j

SHIBASAKI, K.; GOTO, M.
Composition of organic acids in "Sendai-miso" (fermented soybean paste of the Sendai type). (Tohoku Univ., Sendai, Japan). Nippon Jozo Kyokai Zasshi 1964, 59(6), 509-13 (Japan).

The compn. of Et_2O-sol. org. acids in "Sendai-miso" (I) was examd. by partition chromatography with SiO_2gel. I contained at least caproic, butyric, propionic, levulinic, acetic, pyruvic, formic, α-oxoglutaric, succinic, lactic, malonic, pyroglutamic, glycolic, malic, and citric acids. Lactic, citric, succinic, pyroglutamic, and malic acids were the major components, their contents in % of total acids were, rep.: 20-30, 10-30, 10-18, 6-21, and 3-15%. The total amt. of org. acids in I was 100-500 mg./100g., and the content increased with the maturity of I.
CA, V. 63, 1965: 13945e

SHIBASAKI, K.; IWABUCHI, S.
Aroma of miso. I. Volatile carbonyl compounds. (Fac. Agr., Tohoku Univ., Sendai, Japan). Nippon Shokuhin Kogyo Gakkai-Shi 1970, 17(5), 193-200 (Japan).

Volatile carbonyl compds. of miso were sepd. by steam distn. and were prepd. as 2,4-dinitrophenylhydrazones. Identification of these compds. was carried out by means of thin-layer and gas-liq. chromatog, as well as uv and ir. H_2CO, EtCHO, iso-PrCHO, iso-BuCHO, 2-methyl-butyraldehyde, and furfural were identified, and H_2CO and $(Ac)_2$ were tentatively identified. At least 2 diketone compds. were detected but not identified sufficiently. H_2CO and furfural were main components among these carbonyl compds., being followed by iso-BuCHO and 2-methylbutyraldehyde. Removal of the carbonyls from the volatile fraction resulted in a loss of miso aroma, indicating these compds. contributed to miso aroma.
CA, V. 73, 1970: 97584m

SUGIMURA, K.; TAIRA, H.; et al.
Amino acid contents of processed soybean. III. Total and free amino acids of soybean miso. (Min. Agr., Tokyo). Eiyo to Shokuryo 1962, 14(5), 411-13; cf. h CA 59, 4480b.

The 18 amino acids of 3 different kinds of miso (fermented soybean paste) were detd. by microbioassay. The samples of miso were made from (1) whole soybean and warmed ripening, (2) whole soybean and natural ripening, or (3) defatted soybean and warmed ripening. The contents of arginine (Arg), cystine (Cys), and lysine (Lys) based on N contents of the samples were less in all 3 samples as compared with those of raw soybean. The contents of glutamic acid (Glu), aspartic acid (Asp), phenylalanine (Phe), and glycine (Gly) in miso were almost the same as in raw soybean and the contents of the other amino acids were slightly higher in miso samples. Alanine of (1) was higher than in (2), and Cys, Lys, and proline (Pro) of (1) were lower than in (2). Isoleucine, Phe, and tryptophan (Try) of (1) and (2) were higher than in (3) and Pro of (1) and (2) was lower than in (3). There was no difference in free amino acids contents in (1) and (2). However free forms of Glu, Gly, leucine, Pro, and valine of (3) were lower than in (1) and (2) and Try of (3) was higher than in (1) and (2).

IV. Variation of total and free amino acid contents in soybean miso processing. Ibid. 414-19.

Changes in amino acids during the course of the production of miso was investigated. The processes involved the soaking of soybean in water, steaming, mixing with koji, and ripening. Total Lys and Cys decreased by steaming and further decreased at the ripening stage. Total Arg decreased in the ripening stage. The rates of liberation of Pro and methionine were higher than those of other amino acids while the liberation of Cys was lower. No significant difference in total and free amino acid patterns between warmed ripening and natural ripening was observed.
CA, V. 60, 1964: 7369h

TAKAGI, H.; OKAMOTO, R.
Quality of homemade miso (soybean paste) used by farm families. IV. Histamine content in miso. (Natl. Inst. Agric., Tokyo, Japan). Eiyo To Shokuryo 1975, 28(5), 235-8 (Japan).

Homemade miso (147 samples) were analyzed. The histamine [51-45-6] content was in a range of 0-28 mg%. There was no correlation between the histamine content and duration of aging or the content of NaCl.
CA, V. 84, 1976: 29412f

TAKAGI, H.; OKAMOTO, R.
Quality of homemade miso (soybean paste) used by farm families. V. Tyramine content of miso and its general quality. (Natl. Inst. Agric., Tokyo, Japan). Eiyo To Shokuryo 1975, 28(5), 239-45 (Japan).

Miso contg. large amts. (> 11 mg %) of tyramine [51-67-2] had a tendency to be of high moisture content and high histamine [51-45-6] content. There was no significant correlation between the tyramine content and the Eh value of miso samples.
CA, V. 84, 1976: 29413g

TAKAGI, H.; OKAMOTO, R.
Studies on the qualities on home-made miso (soybean paste) used by farm families. VI. On the tyramine formation by microbes isolated from home-made miso. (Natl. Inst. Agric. Sci., Tokyo, Japan). Eiyo To Shokuryo 1975, 28(6), 319-25 (Japan).

Tyramine [51-67-2] formation was obsd. by lactic acid bacteria strains sepd. from samples of high-tyramine miso. No activity of tyrosine decarboxylase was detected in representative bacilli and yeasts. Tyramine formation decreased with increasing concns. of NaCl [7647-14-5] in culture media, and was not obsd. in the medium contg. 13% NaCl.
CA. V. 84, 1976: 88216t

YOSHIDA, T.; YOSHII, H.
Oil of soybean miso. II. Changes of oil in miso of various manufacturing methods. (Food Res. Inst., Nagoya, Japan). Miso No Kagaku To Gijutsu 1970, (200), 46-9 (Japan).

Soybean miso was prepd. from soybean koji and brine (A); soybean koji, the same amt. of cooked soybeans, and brine (B); and cooked soybeans, enzyme prepn., and brine (C). The oils extd. from miso were analyzed for acid no., I no., sapon. no., and peroxide no., and the fatty acids of the oil were analyzed by gas chromatog.
The amt. of crude fat and acid no. were remarkably different among the samples; crude fat content and acid no. of the oil of A were greater than those of C, which increased during ripening. Although the increase of acid value was very great, the peroxide value was low, indicating no deterioration of the oil by oxidn. No characteristic difference was seen among the properties of crude fat and fatty acids of the 3 types of miso.
CA, V. 80, 1974: 144491k

YOSHIDA, T.; YOSHII, H.
Oil of soybean miso. III. Antioxidative activity of crude fat of soybean miso. (Food Res. Inst., Nagoya, Japan). Miso No Kagaku To Gijutsu 1970, (200), 50-5 (Japan).

Oils were extd. from soybean miso made from soybean koji and brine. The antioxidative substances could be effectively extd. with 95% EtOH or acetone from miso. The antioxidative activity was greater than that of tocopherols in soybeans. The activity was crude fat > unsapond. > sapond. fat.
CA, V. 80, 1974: 144481g

YOSHII, H.; KAWAKISHI, S.; et al.
II. Changes in amounts of organic acids during miso fermentation. Nippon Nogei-Kagaku Kaishi, 1961, 35, 351-4.

Changes in amts. of org. acids during miso fermentation under natural and the warmed condition was studied on a silica-gel column. Acids were formed by microorganisms most abundantly in the koji-making process throughout the miso fermentation, and the amts. of org. acids formed during the warmed ripening process were larger than those formed during natural ripening. Acetic and lactic acids were formed in both the koji-making and ripening process, but larger amts. of these acids were formed in koji making. On the other hand, malic and citric acids were mainly formed in the ripening process. The patterns of changes in amts. of lactic, acetic, malic, citric, formic, pyroglutamic, glycolic, and oxalic acids under natural and warmed conditions throughout the miso brewing were shown.
CA, V. 59, 1963: 15864c

e. Toxins

EBINE, H.; MIYAIRI, M.
Enriched miso. VIII. Trial to enrich iron in miso. (Natl. Food Res. Inst., Tokyo, Japan). Miso No Kagaku To Gijutsu 1970, (193), 28-30 (Japan).

The anal. data on Fe of com. miso in 1969 by at. absorption gave 2.94 ± 0.36 mg % at a 5% error level. This value is very low in comparison with 5.71 ± 1.15 mg % in 1955. The effect of various salts of Fe on the color of light yellow salty miso were investigated on a lab. scale. Addn. of org. salts. of Fe gave a decrease of Y (%) (CIE notation) accompanied by an increase of the x value, whereas addn. of inorg. salts of Fe gave a decrease of both Y and x. When ferric citrate was employed, addn. of 1 mg Fe to 100 g miso was possible, but 2.5 mg iron unfavorably affected both the color and flavor.
CA, V. 80, 1974: 106926y

KINOSHITA, R.; ISHIKO, K.; et al.
Mycotoxins in fermented food. (City of Hope Med. Center, Duarte, Calif.). Cancer Res. 1968, 28(11), 2296-311 (Eng).

Studies were made in several regions of Japan noted for a high incidence of death by cardiovascular diseases, stomach cancer, and hepatoma. From 24 samples, including miso (fermented soybean paste), katsuobushi (fermented dry bonitos), and starters used for their fermentation processes, 37 strains of fungi were isolated, 21 of which

produced toxic culture filtrates and exts. Many of them produced kojio acid and β-nitropropionic acid. Short-term animal expts. showed extensive hemorrhagic erosion in the glandular stomach, necrosis in the liver, glomerulotubular nephritis, renal tubular oxalosis, pancreas islet hemorrhage and degeneration, and myocardial hemorrhage and scar formation. The toxic effects of these fungi may be related to the high incidence of cardiovascular disease and chronic gastric and hepatic diseases.
CA, V. 70, 1969: 36160m

KOBAYASHI, A.; TOYA, M.; et al.
Evaluation of the safety of sotetsu-miso cycad bean paste. Chemical survey of toxic substances and long-term feeding tests. (Fac. Agric., Kagoshima Univ., Kagoshima, Japan). Eiyo To Shokuryo 1974, 27(6), 263-8 (Japan).

Several samples of home-made "sotetsu-miso" were free from cyasin and aflatoxins. Exptl. brewed "sotetsu-miso" fed to rats at 10-50% levels in the diet for 62 days, or 10% level for 190 days did not produce cancer.
CA, V. 82, 1975: 84721q

KWON, T.W.
Fermented foods in Korea.
Annotated bibliography (1917-1971)
Korean Institute of Science and Technology
Seoul, Korea 1972. 184 p.
Author

LEE, T.Y.; LEE, S.K.
Studies on Toxic Metabolites Occuring in Foods. I. Screen Test of Aflatoxin in some Korean Fermented Soybean Foods. J. Kor Assoc. Food Sci. 1969, 11, 78-84 Fig. 6 Tab. 2 Ref. 23

An attempt has been made to investigate the possible occurrence of aflatoxins, a group of micotoxin which are toxic metabolites produced by Aspergillus flavus, and aflatoxin like substances in fungal fermented soybean products such as maju and soybean paste. Chloroform extracts from 15 samples which has been defatted with petroleum ether are subjected to separations with thin-layer chromatography on silica gel washed with methanol prior to film coating, improves the chromatographic separation and ultraviolet absorption spectral identification. In addition to fluorescencing spot having an Rf value which is same as aflatoxin B, many of the fluorescencing spots have occured in every sample examined.
Korean Sci. Abstr., V. 2, 1970: 230

MANABE, M.; ONUMA, S.; et al.
Fluorescent compounds in fermented foods. II. Tests on aflatoxin contamination of miso and miso-koji in Japan. (Natl. Food Res. Inst., Tokyo, Japan). Nippon Shokuhin Kogyo Gakkai-Shi 1972, 19(2), 76-80 (Japan).

Many samples of com. and homemade miso and com. koji for miso were examd. Aflatoxin (I) was detd. according to the AOAC method No. 2 for peanuts. Because of the higher moisture content (~50%) of miso, 75% MeOH was used as the solvent. No I was detected in any samples. A few samples showing a I-like fluorescent substance on thin-layer chromatog. were not toxic in the chick embryo test. Liq. chromatog. with Sephadex G-10 and uv absorption were also applied to examine I.
CA, V. 81, 1974: 167973d

MANABE, M.; SHINJI, M.
Fluorescent compounds in fermented foods. IV. Degradation of added aflatoxin during miso fermentation. (Natl. Food Res. Inst., Tokyo, Japan). Nippon Shokuhin Kogyo Gakkai-Shi 1972, 19(6), 275-9 (Japan).

Aflatoxins B_1 and G_1 were stable at pH 4-5 and were decompd. at pH and pH 9-10. At pH 1-3 aflatoxins B_1 and G_1 were changed to B_{2a} and G_{2a}, resp. The pH of 95 samples of miso collected from many regions of Japan was in the range of 4.6-5.4, and the possibility of decompd. of aflatoxins due to H^+ was excluded. Small amts. of aflatoxins B_1, B_2, G_1, and G_2 were added to the mixed raw materials for miso before fermn. Some B_1 and G_1 was decompd. during the early stage of ferm. and ~50% of both remained after 1 month of fermn. at 35°. Aflatoxins B_2 and G_2 were not changed during the fermn. of miso.
CA, V. 81, 1974: 167979k

MATSUMOTO, K.; KOMATSU, N.
Antiseptics for miso. Vitamins K_3 and K_5 as antiseptics for miso. (Govt. Inst. Brewing, Tokyo). J. Soc. Brewing 1952, 47, 513-16 (Japan).

Both vitamin K_3 and vitamin K_5 were effective as the antiseptics for miso, when the formation of white fungi on the surface was observed with 50 g. miso, 5 g. H_2O, and NaCl soln. contg. the antiseptics and white fungi, kept at 30°. The fungi were not formed for 20 days when more than 0.08% of vitamin K_3 or more than 0.04% of vitamin K_5 was used. However, undesirable discoloration occurred with such addn. Butyl p-hydroxybenzoate was not effective as an antiseptic for miso.
CA, V. 49, 1955: 5766c

NAOI, Y.; OGAWA, H.; et al.
Mycotoxins in foods. IV. Detection of sterigmatocystin in miso and soy sauce. (Tokyo Munic. Res. Lab. Public Health, Tokyo, Japan). Tokyo Toritsu Eisei Kenkyusho Kenkyu Nempo 1972 (Pub. 1973), (24), 207-17 (Japan). Cf. CA 78; 134535x.

Miso or soy sauce (50 g) to which 20 μg sterigmatocystin (I) was added was extd. with n-hexane-MeOH (100:60). The MeOH layer was sepd. and was extd. twice with 50 ml $CHCl_3$. The $CHCl_3$ layer was applied to a column of Florisil-silica gel or Florisil-Celite (10 g each). I adsorbed on the column was eluted with 250 ml

C_6H_6-MeOH (9:1), which was evapd., and residues were dissolved in 1 ml $CHCl_3$-MeOH (1:1), and thin-layer chromatographed with C_6H_6-MeOH-AcOH (90:1:5). A fluorescent spot of I was sepd.
CA, V. 80, 1974: 94308h

NARAYANA RAO, N.; DWARAKANATH, C.T.; et al.
Development of pre-digested protein rich food based on Indian oilseed cakes and pulses-part I. (Central Food Tech. Res. Ins., Mysore).
J. of Food Sci. and Tech. 1968, 5(4), 198-201.

A process for the preparation of a predigested protein-rich food by pure culture fermentation of Indian oil seed cakes and pulses has been outlined. This paper deals with the standardisation of conditions for rice-koji and the laboratory trials on the preparation of miso-like products from soybean and combinations of soybean with oilseed cakes.
Royal Tropical Institute tt194

NARAYANA RAO, N.; RAMACHANDRA RAO, T.N.; et al.
Development of pre-digested protein rich food based on Indian oilseed meals and pulses II. (Central Food Tech. Res. Inst., Mysore).
J. of Food Sci. and Tech. 1972, 9 (2), 57-62.

Several batches of 'miso' were prepared using oilseed meals individually and in combination with pulses. Variation in processing from conventional method was sought with regard to the reduction of salt concentration from 7-10 per cent to 2.0 per cent by the addition of 1.0 per cent alcohol extracts of either pepper or chillies and replacement of rice-koji with corn-koji. The material was dehydrated after fermentation using either freeze-drier or vacuum shelf-drier. Chemical analysis of wet as well as dehydrated material was conducted. After the initial laboratory trials, attempts were made to prepare miso-like products on a fairly large scale on the basis of accepted ratios of raw materials.
Author.

III FERMENTED COCONUT PRESS CAKE

BONGKREK

a. Method of Preparation

DJIEN, K.S.

Tinjauan terhadap penelitian fermented foods Indonesia. (A review on fermented food research in Indonesia). Research in Indonesia 1945 - 1965, II: Technology and Industry, p 209-223

Summary : Scientific research on fermented foods in Indonesia commenced at the end of the 19th century. From the many fermented foods in Indonesia, soybean tempe in particular is very much in the limelight of the scientific world, especially after 1945. Tempe bongkrek also comes under much observation in connection with the many incidents of bongkrek poisoning in Central and East Java. Research on oncom, yeast, fermented cassava, fermented glutinous rice and palm wine has not yet been so advanced as for tempe. Research results of fermented foods in Indonesia do not cause the use of modern methods and equipment in their production such as is case with some fermented foods in other countries.
Author

b. Microorganism

HARDJOHUTOMO, H.

Oxalis corniculata bagi pembikinan bongkrek (Oxalis corniculata for "bongkrek" production). Maj. Berk. Pert. 1958, 9(5), 227-42

Bongkrek is a fermentation product (by Mucor) of coconut-residue after extracting oil, either pure or mixed with a more or less high percentage of soybean or press residue of groundnuts. It is very cheap, although a low (6 percent) protein product. The method of preparation is given. If the air-moisture content is high, bacteria develop as a slimy cover on the cakes, and the growth of Mocur is suppressed. The bacteria (Bacterium cocovenenans Mertens) produce a deadly poison which makes sometimes hundreds of victims. Experiments showed that the lower the air-moisture the better Mocur develops and the less Bacterium cocovenenans. One way to get rid of the bacteria which lives on the rests of oil in the cakes in infection with Monilia sitophila which breaks down oil more quickly than the bacteria, but the taste of the product is different and not appreciated. Experiments carried out with aureo and terramycin showed inhibition of bacterial growth, but the price of these antibiotica is prohibitive. Experiments were carried out with phytonzida; tomatin, obtained from Lycopersicum pimpinellifolium showed effect on bongkrek-bacteria. From 15 different plant species press sap of leaves was tried out; of these only those of Oxalis corniculata showed a positive result; tubers and roots of several plants were negative. Five different species of Oxalis were tried out, only O. corniculata proved to be effective. Removal of the acids of the press sap

of Oxalis had no influence on the positive result. Experiments were carried out by mixing dry, pulverized Oxalis leaves with the cakes; they all showed lively growth of bacteria; contrarily if a solution of Oxalis press sap was added, which penetrated the cakes thoroughly no bacteria developed if a certain minimum of Oxalis was given.
Author

c. Toxins

AMAR, D.; GREVENSTUK, A.
Bijdrage tot de kennis der bongkrekvergiftigingen ("Contribution to the knowledge of bongkrek poisoning"). Geneesk. Tijdschr. Ned. Ind., 1935, 75: 104

The authors describe the symptoms of toxoflavin poisoning in humans and in experimental animals. In man, toxoflavin acts primarily as a heart poison. Further study of the pharmacological effect to toxoflavin on the organism is made and a good therapy sought.
Nut. Bibl. Ind., 1955: 3

AMAR, D.; GREVENSTUK, A.
Bijdrage tot de kennis der bongkrekvergiftigingen ("Contribution to the knowledge of bongkrek poisoning"). Geneesk. Tijdschr. Ned. Ind., 1935, 75: 366

The effects of the colorless bongkrek poison (bongkrek acid) in experimental animals are described. Both the findings at autopsy and the pharmacological reactions are studied. Although no satisfactory therapy is found, some suggestions for clinical treatment of bongkrek poisoning are presented.
Nut. Bibl. Ind., 1955: 3

MERTENS, W.K.; VAN VEEN, A.G.
De bongkrekvergiftigingen in Banjoemas, le mededeling ("Bongkrek poisoning in Banjoemas, First report"). Geneesk. Tijdschr. Ned. Ind., 1933, 73: 1223

In Banjoemas (Java), poisoning occurred repeatedly due to eating of tempe-like products, such as coconut press cake, groundnut press cake, and soybeans treated with fungi under certain controlled conditions. The symptoms observed in humans and in experimental animals are described. The disease was caused by bacteria named bongkrek bacteria (B. cocovenenans). They were found to grow on various media, but poison was formed in only a few instances. Their occurrence and biological properties are studied.
Nut. Bibl. Ind., 1955: 64

VAN VEEN, A.G.
Toxic properties of certain unusual foods. (Grad. Sch. Nutr.,

Cornell Univ., Ithaca, N.Y.). Toxicants Occurring Natur. Food, 2nd Ed. 1973, 464-76 (Eng). Nat. Acad. Sci.: Washington, D.C.

The toxic effects of ingestion of quail, djenkol (Pithecolobium lobatum) beans kava-kava (Piper methysticum), Leucaena glauca, bongkrek ackee fruit (Blighia sapida), and miracle fruit (Synsepalum dulcificum) are reviewed with 47 refs.
CA, V. 80, 1974: 78827w

VAN VEEN, A.G.; MERTENS, W.K.
De bongkrekvergiftigingen in Banjoemas, tweede mededeling ("The bongkrek poisonings in Banjoemas, Second report"). Geneesk. Tijdschr. Ned. Ind., 1933, 73: 1309

The bacteria develop toxins only in certain copra products. Cases of poisoning were almost entirely localized to the region of Banjoemas. The incidence was low. Analysis disclosed two types of toxins: a yellow toxin which was named "toxoflavin", and a colorless poison. The method of isolation of the yellow toxin is described. So far no effective antidote or therapy has been discovered.
Nut. Bibl. Ind., 1955: 101

VAN VEEN, A.G.; MERTENS, W.K.
Toxic constituents of the so-called bongkrek poisoning in Java. Rec. trav. Chim.,1934. 53, 257-66

The investigation was undertaken to ascertain the toxic principles formed in bongkrek and semaji, 2 auxiliary foodstuffs commonly used in middle Java, but not infrequently of high toxicity. The toxic substances, 2 in no., were isolated only after the most tedious and careful procedures, by the repeated use of immiscible solvents Et_2O, $CHCl_3$, petr. ether and aq. solns. of varying pH values. The essential facts developed were: The poisonous principles result from the action of certain bacteria (notably "bacterium bongkrek") on domestic by-products of the coconut (press cake). Soy bean and peauut cake treated in a similar manner do not develop these poisons. Cooking or roasting of bongkrek or semaji has little or no effect on their toxicities. Of the 2 poisonous principles one formed yellow flat needles or leaflets (1), m. 171-20, the other (II) a colorless fatty (thus far non-cryst.) product. I appears to be a high-mol. protein-like substances in loose combination with a lower mol. yellow protein-like substance, dissocn. gradually taking place by the action of heat, EtOH, certain salts. etc., whereby the toxicity becomes markedly less. The development of I and II is invariably shown by the appearance of a yellow color, and may result by bacterial action not only on bongkrek and semaji, but on glycerol, oleic, stearic and palmitic acids, certain hexoses, pentoses and sugar alcs. in suitable nutrient medie. I induces narcotic phenomena; II induces tetanic phenomena. II is N-free, has the character of an acid, is easily oxidized and is extremely sensitive to heat.
CA, V. 28, 1934: 2426^5

VAN VEEN, A.G.; MERTENS, W.K.
De invloed van het bongkrekzuur op de koolhydraatstofwisseling ("Influence of bongkrek acid on the carbohydrate metabolism"). Geneesk. Tijdschr. Ned. Ind., 1935, 75: 1116

Bongkrek acid lowers the blood sugar level. Its chemical composition is different from other substances which lower the blood sugar level. It is N-free and has the properties of strong unsaturated oxy-acid ($C_{11}H_{16}O_3$). It is very toxic; 0.5 mgm. can kill a monkey weighing 1 1/2 kg. within two days. In lethal doses, the liver and heart glycogen disappear almost entirely, while the glycogen is retained in the muscular tissue. This leads first to hyperglycemia, later to hypoglycemia. Other phenomena related to bongkrek acid poisoning are also described. The results obtained in experimental animals corrspond to the symptoms in humans.
Nut. Bibl. Ind., 1955: 103

IV SAUERKRAUT

a. Method of Preparation

DOWNING, D.L.; STAMER, J.R.
Remarks of panel discussion on sauerkraut production. (Dep. Food Sci. Technol., New York State Agric. Exp. Stn., Geneva, N. Y.). N. Y. State Agric. Exp. Stn., Geneva, Spec. Rep. 1974, 17, 3-5 (Eng).

A review with no refs., with recommendations for specific operations in the manuf. of sauerkraut.
CA, V. 84, 1976: 72683g

KEIPPER, C.H.; PETERSON, W.H.; et al.
Sauerkraut from pretreated cabbage. Ind. Eng. Chem. 1932, 24, 884-9.

Kraut made from washed cabbage was higher in acidity, chiefly lactic acid, and lower in EtOH than kraut from unwashed cabbage. Good com. kraut contained EtOH 0.35-0.87; lactic acid (titratable acidity) 1.5-2.2, volatile acid as AcOH 0.22-0.51; sugar as glucose 0.11-0.52%. Inocculation of cabbage with bacteria is not recommended. The temp. of the fermenting vats increased about 5° during the first 5 days of fermentation.
CA, V. 26, 1932: 4889^6

KWON, T. W.
Kimchi. (Food Resour. Lab., Korea Inst. Sci. Technol., Seoul, S. Korea). Proc. Int. Symp. Convers. Manuf. Foodst. Microorganisms 1971 (Pub. 1972), 141-4 (Eng). Saikon Publ. Co. Ltd.: Tokyo, Japan.

A review with 11 refs. Kimchi is the name given to a group of delicate, fermented vegetable foods of long tradition in Korea. Cabbage is the major material along with green onion, red chili pepper, garlic, ginger and salt. Usually home made, Kimchi may also include radish root, chestnut, pear mushrooms, sugar, beef, oyster, and fish.
CA, V. 82, 1975: 110332k

LIBBY, Mc NEIL; LIBBY
Sauerkraut. Brit. 883,424, Nov. 29, 1961; U.S. Appl. Feb. 24, 1959; 3 pp.

Shredded cabbage is placed in cans and a 2% NaCl brine contg. 0.2% acid is added, followed by sterilization or pasteurization. The cans are then inoculated with Lactobacillus plantarum, L. casei, L. acidophilus, L. lactis, or L. delbrueckii and closed hermetically and fermentation allowed to proceed. When the acidity calcd. at 1% lactic acid has been reached, the product is ready for consumption, resulting in saving in costs and an increase in yield over conventional methods.
CA, V. 57, 1962: 5078h

MAIKOVA, O.P.; KHANINA, B.I.; et al.
The effects of different methods of sauerkraut-making on its vitamin C content. Trudy Leningrad. Sanit. Gigien. Med. Inst. 1953, 14, 157-61. Referat. Zhur. Khim., Biol. Khim. 1955, No. 3387.

The use of Lactobacillus acidophilus starters is beneficial to the preservation of vitamin C.
CA, V. 50, 1956: 5189d

MARKH, A.T.; FELDMAN, A.L.; et al.
Reasons for darkening in the pickling of cabbage and a method for preserving natural color. (Technol. Inst. Food and Refrigerating Ind., Odessa). Konserv. i Ovoshchesushil. Prom. 1957, 12(8), 14-16.

The factors contributing to the development of undesirable color in the pickling of cabbage are discussed. Darkening depends chiefly upon the reactions which form melanoidin and also upon the destruction of ascorbic acid which interacts with amino acids. A smaller role is played by oxidation of polyphenols and the concn. of Fe and sulfide. In the recommended method dry spices are excluded, the water used does not exceed 0.3 mg. of Fe/l., and the cut cabbage is treated for 3 min. in a soln. contg. 0.23% SO_2, then blanched 1 min. in water, and cooled. The product retains its natural light color, up to 50% of the available ascorbic acid is held, the required organoleptic and chem. standards are met, and normal storage does not affect the color.
CA, V. 52, 1958: 3193i

PEDERSON, C.S.
Examination of fermented foods by laboratory methods. Am. J. Pub. Health 1934, 24, 229-34; cf. C.A. 27,349.

The quality of sauerkraut bears a definite relation to its chem. compn. Defects in fermentation or in canning can often be detected by careful analyses and proper interpretation of the results supplemented by a microscopic examn.
CA, V. 28, 1934: 2801^3

b. Microorganism

FULDE, R.C.; FABIAN, F.W.
Influence of gram-negative bacteria on the sauerkraut fermentation. (Swift & Co., Chicago). Food Technol. 1953, 7, 486-8.

Of 6 lab. fermentations, Aerobacter cloacae predominated in 5 of them. Flavobacterium rhenanus was found in only one of them. Mixed cultures of the 2 organisms with acid-forming bacteria showed that if A. cloacae and F. rhenanus were present in excess they prevented the normal fermentation of sauerkraut. A mixed culture of A. cloacae and Leuconostoc mesenteroides produced acid at a faster rate than a pure culture of L. mesenteroides alone. A. cloacae caused dark sauerkraut with a sharp radish-like flavor and sauerkraut which upon exposure to light became dark.
CA, V. 48, 1954: 14033f

GANGOPADHYAY, H.; MUKHERJEE, S.
Effect of different salt concentrations on the microflora and physicochemical changes in sauerkraut fermentation. (Dep. Food Technol. Biochem. Eng., Jadavpur Univ., Calcutta, India). J. Food Sci. Technol. 1971, 8(3), 127-31 (Eng).

Sauerkraut was prepd. by fermenting shredded cabbage at room temp. with 1.5, 2.25, and 3.0% salt. The highest bacterial count was obtained in the product having the lowest salt concn. The fermentation was initiated by Leuconostoc mesenteroides and was completed by Lactobacillus brevis and Lactobacillus plantarum. Growth of Streptococus faecalis appeared at higher salt concns. The no. of heterofermenters in relation to homofermenters was greater at lower salt concn. Growth of aerobes was suppressed at higher salt concns. Total acid, ratio of volatile and nonvolatile acid, and ascorbic acid, were higher at a low salt concn. With high salt, the sauerkraut had a darker color and firmer texture. Salt addn. of 2.25% yielded kraut of a more acceptable flavor. There was appreciable loss of ascorbic acid after canning of the sauerkraut. When the kraut was thoroughly washed free from salt and acid and then cooked, it was readily acceptable to Indian taste.
CA, V. 76, 1972: 70962h

GARASSINI, L.A.
The biological industries. I. Sauerkraut. (Fac. agr., Maracay, Venezuela). Rev. fac. agr., Univ. central Venezuela (Maracay) 1955, 1, 409-43. (English summary)

The acid concn. in fermentation of batches of 3.5. kg. of 5 cabbage varieties with 2.5% NaCl increased rapidly during the 1st 8 days of fermentation to 1.33-1.67% (calcd. as lactic acid (I)) and fluctuated in the 2nd week though it decreased in most cases. Lactobacillus pentoaceticus, L. plantarum, L. cucumeris, Aerobacter aerogenes, and in one sample Micrococcus chromogenus were isolated during fermentation. Yeast occurred only toward the end of natural fermentation, but showed up from the start if I was added to the cabbage. Addn. of 0.5% I or more produced pink color and disagreeable aroma, 1-2% I prevented bacterial development. 23 references.
CA, V. 50, 1956: 3671e

HANG, Y.D.; SPLITTSTOESSER, D.F.; et al.
Production of yeast invertase from sauerkraut waste. (New York State Agric. Exp. Stn., Cornell Univ., Geneva, N.Y.). Appl. Microbiol. 1973, 25(3), 501-2 (Eng).

The purpose of this investigation was to study invertase production by Candida utilis in sauerkraut waste. Expts. were carried out in 500 ml Erlenmeyer flasks contg. 100 ml of autoclaved sauerkraut waste incubated at 25° and with continuous shaking. Total invertase was detd. directly on the whole culture. Invertase production was approx. parallel to yeast growth. The ratio of total to cellular invertase was ~5:1. The yeast completely neutralized the waste acid, and reduced the BOD and total N and P considerably and thus could be used to reduce the strength of the sauerkraut waste with the concomitant production of yeast invertase.
CA, V. 78, 1973: 134473a

HASELTINE, T.R.
Biological filtration of kraut and pickle waste. (Chester engrs.,Pittsburgh, Pa.). Water and Sewage Works 1952, 99, 161-5.

When wastes from the prepn. of kraut and pickles, with pH of 4,1100

p.p.m. acidity as $CaCO_3$, 4500 to 6500 p.p.m. chlorides, 12,000 to 13,600 p.p.m. total solids, and 2000 to 2400 p.p.m. B.O.D. were passed through a pilotplant filter 10F.t. in diam. and 6ft deep made of blast-furnace slag, max. treatment and 85% B.O.D. removal were obtained when the pH was adjusted to at least 6.6. Chloride concns. up to 5000 or 6000 p.p.m. had litle effect on the biol. efficiency of the filter. No correlation between recycle ratio and B.O.D. reduction was observed.
CA, V. 46, 1952: 10507f

KOEHLER, R.
Sewage, high in organic matter, from food and allied industries, and its biological treatment. (Ger). Wasser, Luft Betr. 1968, 12(7), 403-7 (Ger).

Waste waters from sugar, potato, and sauerkraut processing plants and the possible application of biol. treatment are discussed. Since these wastes are produced only in a relatively short season, one possibility is to store them in large shallow ponds, perhaps with some addnl. aeration. Major drawbacks of this treatment are the generation of odors and the large areas required. Sugar waste waters from storage ponds can be successfully treated by trickling filters. Another possibility is to use the activated sludge process, particularly if it can be combined with treatment of communal sewage. In most cases the anaerobic oxidn. of the sludge in digesters is excellent for decompg. the org. matter. If sep. sewers are used some of the waste waters can be recirculated, either directly or after a short mech. purification step and the addn. of a certain amt. of fresh water.
CA, V. 69, 1968: 99202b

LOPEZ, A.; SCHWARTZ, M.G.; et al.
Nutritional supplementation of lactic acid flora of sauerkraut. (Univ. of Georgia, Athens). Food Research 1954, 19, 564-74.

The effect of certain added nutrients and bacterial starters on the fermentation of sauerkraut was studied. Dextrose, NaOAc, a mixt. of inorg. salts, and a vitamin combination increased final total acidity of sauerkraut, whether used alone or in combinations, with the exception of dextrose and biotin. Use of pure starter cultures of Lactobacillus brevis, L. plantarum, and Leuconostoc mesenteroides did not produce a significant decrease in the final pH, in the total acidity, or in the rate of fermentation. Addn. of CO_2 did not increase the H-ion concn. or the total acidity, except for the first 2 days of the fermentation period. Some off-odors and off-colors were observed in sauerkraut fermented in the complete medium; nevertheless, the flavor was normal except for higher acidity.
CA, V. 49, 1955: 5763i

MAYER, K.; PAUSE, G.
Biogenic amines in sauerkraut. (Eidg. Forschungsanst. Obst-, Wein-Gartenbau, Waedenswil, Switz). Lebensm.-Wiss. Technol. 1972, 5(3), 108-9 (Ger).

The occurrence of headaches as a result of ingestion of sauerkraut led to an investigation of the microbiol. decarboxylation of amino acids to form physiol. active amines. Anal. of 20 samples showed wide differences in the histamine content. In a further anal. of 2 particular sam-

ples, 1 had the histamine content of 20 mg/l. and the other 7 mg/l. Tyramine, cadaverine, and putrescine contents of the high histamine sample were also substantially higher than for the low histamine sample. Microscopic examn. of juices from the 2 samples showed high levels of micrococci in the juice with the high histamine content.
CA, V. 77, 1972: 138493j

MAYER, K.; PAUSE, G.; et al.
Formation of biogenic amines during sauerkraut fermentation. (Eidg. Forschungsanst. Obst.-Wein-Gartenbau, Waedenswil, Switz.). Ind. Obst-Gemueseverwert. 1973, 58(11), 307-9 (Ger).

Most com. sauerkrauts were high in nonvolatile, biol. active or toxic amines. However, 2 brands of sauerkraut, pasteurized in cans, were completely histamine-free. Therefore, conditions for producing sauerkrauts low in amines were sought. The effect of anaerobic and aerobic fermn. at 17 and 23° on the microflora, total acidity, sugar content, and prodn. of 2-phenylethylamine, isoamylamine, tyramine, ethanolamine, cadaverine, putrescine, and histamine was detd. It was concluded that low histamine and tyrosine sauerkraut can be produced by inhibiting the growth of pediococci by early interruption of fermn., just below pH 4, producing a mild low-acid sauerkraut, which is then gently pasteurized.
CA, V. 79, 1973: 124865m

MEHLITZ, A.; DREWS, H.
The biochemistry of the sauerkraut-fermentation. Ind. Obst-u. Gemuseverwert. 1960, 45, 413-18, 496-503.

A review with 84 references.
CA, V. 55, 1961: 3917d

MIKKI, M.S.; ANAND, J.C.
Tolerance limits of Mycoderma in sauerkraut to various additives. (Div. Hortic. Fruit Technol. Indian Agric. Res. Inst., Delhi, India). Indian Food Packer 1972, 26(3), 54-6 (Eng).

Mycoderma was not controlled with $\leq$16% NaCl; growth was delayed with $\geq$8% NaCl. In the presence of 1.5% lactic acid (I), growth occurred in the presence of 8% NaCl but not in 12% NaCl. Growth was inhibited with $\geq$0.6% HOAc, or 0.2% HOAc and 1.5% I. Yeast growth was inhibited with 300 ppm NaOBz or 200 ppm sorbic acid in the presence of 3% NaCl and 1.5% I.
CA, V. 78, 1973: 96234p

MURRAY, R.V.
Microbiology of sauerkraut fermentation. The Crown 1940, 29(4), 18,39.

Sauerkraut is produced from cabbage by a lactic acid fermentation; the other compds. produced (in small amts.) are AcOH, CO_2, mannitol and EtOH. The bacteria in the normal fermentation, the optimum conditions for growth of the normal bacteria and causes of spoilage are discussed.
CA, V. 35, 1941: 845^4

OGAWA, T.; OBATA, M.; et al.
Prevention of film yeast growth on sauerkraut brines by sodium dehydroacetate. (Tokyo Agr. Expt. Sta., Tachikawa, Japan). Nosan Kako Gijutsu Kenkyu Kaishi 1961, 8, 294-7 (Japan).

Cut cabbage was pickled with 2% its wt. of NaCl and 0.005-0.04% of Na dehydroacetate (I). I prevented the growth of film yeast and accelerated the acid fermentation. The addn. of 0.02% I gave the best sauerkraut.
CA, V. 59, 1963: 15853g

PEDERSON, C.S.
Effect of inoculation on the quality, chemical composition and bacterial flora of sauerkraut. N.Y. Agr. Expt. Sta., Tech. Bull. 1933, 216, 3-21; cf. C.A. 27, 349.

The addn. of a starter to shredded cabbage when packed for fermentation is of doubtful value. The best inoculum consisted of either Streptococcus lactis Lohnis or Leuconostic mesenteroides Van Tiegham, but neither improved kraut quality over that obtained by natural fermentation. Definitely detrimental changes were brought about when either Lactobacillus cucumeris Bergey or Lactobacillus pentoaceticus Fred predominated in a fermentation. If the juice has an acidity (lactic acid) of. 3% or more, the kraut is usually of poor quality. If the acidity is. 25% or less, the kraut produced is normal, but no better than when no inoculation is used.
CA, V. 28, 1934: 1418^6

PEDERSON, C.S.; ALBURY, M.N.
The influence of salt and temperature on the microflora of sauerkraut fermentation. (New York Agr. Expt. Sta., Geneva). Food Technol. 1954, 8, 1-5.

The salt content and temp. at which sauerkraut was fermented influenced the bacterial flora, quality, and chem. compn. of the sauerkraut. At 1.0% salt, heterofermentative species such as Leuconostoc mesenteroides and Lactobacillus brevis were favored. At 3.5% salt, fermentation was retarded and L. brevis was almost suppressed. Strains of Pediococcus cerevisiae and Lactobacillus plantarum were isolated more frequently. The suppression or favoring of different species was reflected in the pH-total acidity relation. Lower acidity and lower pH were attained at the higher salt levels. At 7.5°, fermentation did not progress sufficiently in several months to cure the sauerkraut. A high acidity was attained in less than 2 weeks at 37°. Even greater acidity was attained at 32°.

CA, V. 48, 1954: 14097a

PEDERSON, C.S.; KELLY, C.D.
Development of pink color in sauerkraut. Food Research 1938, 3, 583-8.

The development of pink to red color in kraut is due to the growth of certain types of yeasts. The growth of these yeasts is favored by any factor which tends to inhibit or retard the normal sequences of bacterial growth whether it be raised temp. of fermentation, a higher salt or acid content than normal in the cabbage, predominance of certain types of bacteria over others, or a lack of certain nutritives for proper growth. Such kraut shows a lowered volatile acid content. The salt content of pink kraut is often above normal.
CA, V. 33, 1939: 5534^9

SCHULER, R.

Accelerated microbiological fermentation process for the manufacture of soured foods. Ger. Offen. 2,007,785 (Cl. C 12d, A 23b), 26 Aug 1971, Appl. 20 Feb 1970; 7 pp.

For the title process, a lactose nutrient medium e.g. whey, contg. thermophilic lactobacteria, e.g. Lactobacillus bifidus strains, was added to the corresponding food, e.g. cabbage, cucumbers, or herrings, and the mixt. fermented ~24-48 hr at 35-45°. Thus, a culture of L. bifidus in whey contg. addnl.0.8% yeast autolyzate was added to white cabbage chips and the mixt. kept 48 hr at 42° to give fermented sauerkraut which was bottled and pasteurized. L. bifidus fermentation produced addnl. vitamin A in the product.
CA, V. 75, 1971: 139592m

STAMER, J.R.; STOYLA, B.I.; et al.

Growth rates and fermentation patterns of lactic acid bacteria associated with the sauerkraut fermentation. (New York State Agric. Exp., Cornell Univ., Geneva, N.Y.). J. Milk Food Technol. 1971, 34(11), 521-5 (Eng)

Growth rates of 5 species (Leuconostoc mesenteroides, Pediococcus cerevisiae, Lactobacillus plantarum, Lactobacillus brevis, and Streptococcus faecalis) were detd. in filter-sterilized cabbage juice. Leuconostoc mesenteroides, P. cerevisiae, Lactobacillus plantarum, and Lactobacillus brevis had max. viable cell yields within 48 hr of incubation; the onset of the decline was most marked with Leuconostoc mesenteroides. After 3 days incubation, the viable cell count of Leuconostoc mesenteroides decreased ~ 3 log cycles; populations of the other cultures were unchanged. The max. rate of acid production for each culture was assocd. with the period of fastest growth. The types of acid formed were species dependent and appeared to follow the classical hetero- and homofermentative patterns. Growth rates of all cultures, except P. cerevisae, decreased with the addn. of 2.25 or 3.5% NaCl, decreases in pH, or the interaction of both salt and pH. Leuconostoc mesenteroides was markedly inhibited with the decrease in pH. Based on lag and generation times, P. cerevisiae was least affected by NaCl and pH changes; S faecalis was most sensitive. Lactobacillus brevis was less subject to growth inhibition than Leuconostoc mesenteroides. The addn. of NaCl to cabbage juice, pH 6.2, extended the lag phase 1-4 hr. The addn. of 10-100% cabbage juice prefermented by Leuconostoc mesenteroides had no effects on the lag and generation times of Lactobacillus plantarum, Lactobacillus brevis, or Leuconostoc mesenteroides. Generation times were inhibited in P. cerevisiae, esp. at levels > 50%; lag times were not affected. The Lactic population of cabbage consisted of 30% heterolactic cocci, 38% heterofermentative rods, 30% homofermentative rods, and 2% homofermentative cocci. In a mixed culture system, Leuconostoc mesenteroides initiated and predominated during the early fermentation phases.
CA, V. 76, 1972: 111803c

c. Fermentation Studies

AHN, S.Y.

The Study on the Fermentation of Kimchi (I). The Effect of the Ratio of Ingredients on Kimchi Fermentation. Rep. Nation. Ind. Res. Inst. 1970, 20, 61-68, 7 Fig. 3 Tab. 4 Ref.

The effect of the various condiments and spices at the different ratio was examined in the experiment on the acid-producing during fermentation of Kimchi. The tested condiments and spices were table salt, leek, garlic, red pepper, fermented anchovy and ginger. It is noted that the acid-producing in Kimchi is depressed by the addition of table salt at the concentration above four percent and accelerated at the concentration below three percent, and that the fermentation of Kimchi is accelerated by the addition of garlic, red pepper and fermented anchovy. Red pepper is the most effective, and it is assumed that it contains some effective component for the growth of the acid-producing microorganisms on fermentation of Kimchi.
Korean Sci Abst., V. 4, 1972: 107

BATES, R.P.; MATTHEWS, R.F.
Lactic fermentation of Florida vegetables. (Food Sci. Dep., Inst. Food Agric. Sci., Gainesville, Fla.). Proc. Fla. State Hort. Soc. 1971 (Pub. 1972), 84, 253-7 (Eng).

Lactic acid fermn. induced by the natural microflora produced stable, acceptable vegetable condiments from celery, radish, and carrot slices. None of the freshly fermented vegetables had tastes preferable to that of sauerkraut. Acidity increased rapidly over the 1st week with the rate of fermn. increasing with temp. Carrots with the highest sugar levels had the highest acidity. Volatile acidity was not related to fermn. temp. Products retained the crispness and color of the original vegetables and possessed taste characteristics similar to that of sauerkraut or pickled foods, yet distinctive to each vegetable. A mixed sample contg. equal portions of the 3 vegetables lacked the distinctive red, orange, and green color contrast, owing to fading of the celery and radish slices. Color fading also occurred in a pack of equal quantities of the 3 vegetables combined after fermn. Pasteurizing sour radish by heating at 100° for 10 min slightly decreased the color of the pack. The recommended conditions of manuf. required slices 0.3-1 cm thick, 2.25% salt, and temps. of 16-32°. Fermn. should proceed to at least pH 4.0 or formation of 0.5% lactic acid.
CA, V. 78, 1973: 41768k

CHUNG, H.W.
Studies on the effect of furylfuramide (AF-2) on Korean Kimchi.
J. Kor. Agr. Chem. Soc. 1969, 12 (57-67)

1. Many bacterial strains identified as Bacillus megeterium, Bacillus subtilis and Bacillus lichemiformis were abundantly found in summer jokal kimchi, but the most dominant strains in summer kimchi were Lactobacillus plantarum and Lactobacillus buchneri.
2. Bacillus groups found in kimchi were sensitive in a low concentration of AF-2, but groups of lactic acid bacteria were resistant to a high concentration of AF-2.
3. Allowable concentration of AF-2 in Korean kimchi is less than 10 p.p.m.
4. AF-2 was not suitable for the juice kimchi as a preservative because the color of juice kimchi was somewhat changed into orange red when 10 p.p.m. of AF-2 was added.

5. High concentration of AF-2 leads the heterofermentation of kimchi bacteria to the homofermentation.
6. Microflora of kimchi was influenced even in the concentration of 10 p.p.m. but it was impossible to check the acidification of kimchi in summer with 50 p.p.m. concentration of AF-2.
7. About 25% of AF-2 was consumed in kimchi fermentation for day at 23°C~25°C.

Korean Sci. Abstr., V. 2 (6) 1970: 732

FULDE, R.C.; FABIAN, F.W.

Electrode potential measurements of fermenting sauerkraut as influenced by Aerobacter cloacae. (Michigan State Coll., East Lansing). Appl. Microbiol. 1955, 3, 198-201.

A study of the importance of oxidation-reduction potentials in relation to optimum growth of lactic organisms during the sauerkraut fermentation as influenced by the introduction of A. cloacae into the fermentation showed that the growth of the Aerobacter resulted in lowering of the potential, which in turn favored the growth of the acid-forming bacteria. The electrode potential measurements were apparently not adjusted for the change in pH of the samples; after 80 hrs. fermentation the readings were approx. 0.0 v. with the titratable acidity varying from 0.7 to about 2.5 ml. 0.165N NaOH per ml. of sauerkraut juice.

CA, V. 49, 1955: 13590i

HORUBALA, A.

Effect of citric acid on sauerkraut fermentation. (Szkola Glowna Gospodarstwa Wiejskiego Warsaw). Acta Microbiol. Polon. 1955, 4, 27-42.

Bacteria isolated from fermenting cabbage form acetoin (I) in presence and absence of citric acid (II). Addn. of II to fermenting cabbage does not increase I production.

CA, V. 49, 1955: 11233g

HYUN, O.K.; HEI, S.R.

Studies on the nonvolatile organic acids in Kimchis fermented at different temperatures. Kor. J. Food Sci. Technol. 1975, 7 (2), 74-81. (Article in Korean)

Nonvolatile organic acids were determined in raw chinese cabbage, kimchis fermented at 6° 7°C and at 22° 23°C. Total acids were isolated by ion-exchange chromatography and quantitative determination of individual acids was performed by silicic acid partition column chromatography. Acids were identified qualitativly by paper chromatography. Palatability of Kimchis was evaluated by nine pannels. Results were as follows: Maleic, fumaric, lactic, succinic, malonic, oxalic, glycolic, malic, citric, tartaric, sulphuric and phosphoricacid were found in raw chinese cabbage, Kimchis fermented at 6° 7°C, and at 22° 23°C. In raw chinese cabbage, most of organic acids were in salt form and malic acid was highest in amount. In Kimchi fermentd at 6° 7°C, the amount of lactic acid and succinic acid was higher than that in Kimchi fermented at 22° 23°C, and, tartaric, oxalic, malic, malonic, maleic, glycolic and fumaric acids were less than those in Kimchi

fermented at 22°∿23°C. Kimchi fermented at 6°∿7°C had a more sour flavour taste than Kimchi fermented at 22°∿23°C. It is assumed that large amount of factic acid and succinic acid in Kimchi fermented at 6°∿7°C have a connection with sour flavour taste.
Korean Sci. Abstr., V. 7 (5) 1975: 668

KEIL, W.; KRITTER, H.
The chemistry and pharmacology of fermented foods I. Arch. exptl. Path. Pharmacol. 1934, 175, 736-44.

Sauerkraut juice stimulates the contraction of guinea-pig intestine, the stimulation being only partially prevented by atropine. The effective constituents are histamine and acetylcholine, isolated in pure state and present in the juice in a 1: 25,000 concn. The juice also contains putrescine. Its cathartic action is not due to any of the foregoing constituents. Wine vinegar also contains histamine, demonstrable by pptn. and color reactions and pharmacol. tests. Betaine can be isolated from wine vinegar. Sour milk contains choline, but no demonstrable histamine.
CA, V. 28, 1934: 6840^6

MAYER, K.; PAUSE, G.; et al.
Fermentation characteristics and histamine formation in sauerkraut production. (Eidg. Forschungsanst. Obst-, Wein Gartenbau, Waedenswil, Switz.). Mitt. Geb. Lebensmittelunters. Hyg. 1974. 65(2), 234-8 (Ger).

Total acid, pH, and histamine contents as well as changes in the bacterial flora were detd. in 2 batches of fermenting sauerkraut. With the appearance of lactic cocci (Pediococcus cerevisiae) the histamine content increased rapidly to a high of 160 mg/kg after 10 weeks. Histamine formation started when cocci reached 50 X 10^6/ml.
CA, V. 82, 1975: 123554j

MENEZES, DE; TOBIAS, J.B.
Food produced by lactic fermentation. (Brazil) Bol. Inst. Technol. Aliment., Sao Paulo 1972, (31), 1-30 (Port).

Review of fermn. of vegetables by lactic acid bacteria in the prodn. of pickles, olives, and sauerkraut. 54 refs.
CA, V. 78, 1973: 122694k

NALDI, P.
Fermentation of vegetable substances. Fr. 888,022, Nov. 30, 1943.

Single or several successive fermentations are used to exhaust the fermentable substances in vegetable hydrolyzates or other materials. Alcs., fatty acids, and ketones are produced. E.g. an acid hydrolyzate is neutralized with NH_3; the equiv. of 4 g. $(NH_4)_2SO_4$/l. is thereby supplied. The sugar concn. of the filtrate is made to 25 g./l. Lignin (10-15 g./l.) from the filtration step is added to provide nitrogenous materials and a phys. support for microbial growth. Without sterilization, an acetone-BuOH fermentation is carried out at 37° for 48 hrs. with a yield of 14%, based on reducing sugar. The vinasse freed of alcs. and acetone is enriched, if necessary, brought to pH 7.0-7.5

with $CaCO_3$, and subjected to the lactic butyric-cellulosolytic yeast (I) fermentation. The fermented wort is boiled with slaked lime to recover NH_3. Next, fatty acids are converted to ketones. The solids are recovered for fertilizer, and the N content is increased by neutralization with HNO_3. A 2nd example of exhaustive fermentation is the yeast-EtOH followed by the I fermentation of sulfite waste liquor; a 3rd example is the total fermentation of sulfite waste liquor in a single I fermentation.
CA, V. 47, 1953: 3517a

PEDERSON, C.S.
Relation between temperature and the rate of fermentation of commercial sauerkraut. N.Y. Agr. Expt. Sta., Bull. 1932, 614, 3-23; cf. C.A. 23, 5516.

The lower the temp. the slower the fermentation. The temp. of the cabbage depends on the atm. temp. at the time it is cut up for kraut. The rate of heat transmission into wooden kraut tanks is very slow in fermenting into wellripened kraut. High fermenting temps. often lead to off-flavors. The optimum temp. is approx. 24°.
CA, V. 27, 1933: 349^5

PEDERSON, C.S.
The relationship between temperature and the rate of fermentation of sauerkraut. Zentr. Bakt. Parasitenk., II Abt., 1935, 92, 338-42.

There is a direct relationship between the temp. of the cabbage in the vat and its rate of fermentation. The rate of transmission of heat through wooden vats is slow; hence the shredded cabbage should be preheated.
CA, V. 30, 1936: 4268^2

PEDERSON, C.S.
Keeping fermenting kraut cold. Food Ind. 1939, 11, 380, 417.

Only CO_2 is evolved during normal fermentation of shredded cabbage into sauerkraut. By keeping the kraut tanks cold. the soly. of the CO_2 is increased and a greater preserving action is thus obtained.
CA, V. 33, 1939: 9472^4

PEDERSON, C.S.
Sauerkraut. (New York State Agricultural Experiment Station, Cornell University, Geneva, New York). Adv. Food Res., 1960, 10, 233-291.

Fermentation is a very ancient method of storing foods while retaining their nutritive value. The practice antedates recorded history. Originating in the Orient, it is still an important method of food preservation. Methods of fermenting vegetables in the East vary considerably, and any food or mixture of foods produced in excess of immediate needs may be thus preserved. The fermentation industries in the United States have evolved from ancient methods, but focus on relatively few products. Successful preservation of many foods depends on the acids produced by lactic acid bacteria. These acids, which restrict or inhibit the growth of various undesirable organisms, are produced primarily by conversion of carbohydrates, with some concomitant changes in other constituents.

Nutritional value is little changed since such fermentations cause little change in caloric value, minerals, or vitamins. Many Oriental fermentations are obviously similar to those employed in the modern processing of sauerkraut, dill pickles, and sour pickles. In the United States fermented foods are eaten primarily as condiments. Sauerkraut is often eaten as an adjunct to other foods to make them more appetizing and digestible. Many values have been ascribed to cabbage and to sauerkraut throughout the ages. It is now generally accepted that cooking other foods with sauerkraut enhances their palatability. Cabbage has been known for centuries as one of the most valuable antiscorbutics. A few centuries ago, it was generally recognized that Dutch seamen remained in better health and were less susceptible to the ravages of scurvy during long sea voyages than were seamen from other countries. Lind (1772) ascribed this to the liberal use of the fermented cabbage carried on all sea voyages. Upon his recommendation, this product became a part of the diet of English seamen; it was eventually replaced by limes. It should be recognized that fermented foods still play an important role in the nutrition of people throughout the world, particularly those who do not have access to canned or frozen vegetables. Fermented foods supplement the inadequate fruit and vegetable diets of many peoples.
Author

PEDERSON, C.S.
Sauerkraut fermentation. (New York Agr. Expt. Sta., Geneva, N.Y.). Food Packer 1956, 37(6), 26,28,31.

The rate of fermentation of sauerkraut under com. conditions was directly proportional to the temp. of the cabbage when the vats were filled.
CA, V. 51, 1957: 14158f

PENG, A.C.
Effect of fermentation, processing, and storage on lipid composition of sauerkraut. (Dep. Hort., Ohio Agric. Res. Dev. Cent., Wooster, Ohio). J. Sci. Food Agric. 1975, 26(9), 1325-32 (Eng).

The changes in lipid compn. and fatty acid distribution of sauerkraut during fermn., canning, processing, and storing were studied organoleptically and chem. Total lipids, neutral lipids, and glycolipids increased, and phospholipids were unaltered, during fermn. and processing. Changes in fatty acid compn. were primarily in the distribution of palmitic, stearic, oleic, linolenic, and linoleic acids. Total lipids did not relate to organoleptic evaluation. Phospholipids increased during storage; their formation may be catalyzed by a reaction between tin from the cans and polar lipids at the expense of neutral lipids.
CA, V. 84(1976); 3429s

SEUNG, Y.A.
The study on the fermentation of Kimchi (I). The effect of the ratio of ingredients on Kimchi fermentation. Rep. Nation. Ind. Res. Inst. 1970, 20, 61-68.

The effect of the various condiments and spices at the different ratio was examined in the experiment on the acid-production during

fermentation of Kimchi. The tested condiments and spices were table salt, leek. garlic. red pepper, fermented anchovy and ginger. It is noted that the acid-production in Kimchi is depressed by the addition of table salt at the concentration above four percent and accelerated at the concentration below three percent, and that the fermentation of Kimchi is accelerated by the addition of garlic, red pepper and fermented anchovy. Red pepper is the most effective, and it is assumed that it contains some effective component for the growth of the acid-producing microorganisms on fermentation of Kimchi.
Korean Sci. Abstr., V. 4 (1) 1972: 107

d. Nutritive Value and Its Component

ABROSIMOVA, L.N.; YANKELOVICH, S.N.
Vitamin C content of vegetables grown in the Latvian SSR and preservation of vitamins during prolonged storage. Sb. Tr. Vrachei Dorogi 1966, (4), 205-8 (Russ).

Vitamin C was detd. in fresh cabbage, fermented cabbage (sauerkraut), and potatoes. The content of ascorbic acid in fresh and fermented cabbage was $\geqslant$ 30 mg.%, and was present up to March. The max. content of vitamin C in potatoes was in Aug. and Sept., then it fell, and in Feb. was almost zero.
CA, V. 70, 1969: 36550p

BRAMMELL, W.S.
Collaborative study of a potentiometric titration method for determining the sodium chloride content of canned vegetable products. (Div. Food Chem. Technol., Food Drug Adm., Washington, D.C.). J. Ass. Offic. Anal. Chem. 1971, 54(1), 56-60 (Eng).

A potentiometric method was compared with the official method for detg. the NaCl content of canned vegetable products. The proposed method was very easy to use, simple dependable, accurate, precise, and much faster than the present official method. The collaborative study consisted of 8 processed vegetable samples (canned tomato paste, sweet peas, green beans, yellow corn. sauerkraut, dill pickles, and 2 olive samples) submitted to 9 labs. The study indicated good agreement with the official method and very good precision as shown by the low std. deviations. It is recommended that the method be adopted as official first action.
CA, V. 74, 1971: 75251u

BRYUKHANOVA, N.A.
Stabilizers of vitamin C and their use in mass nutrition. (Ministry Health, Moscow). Gigiena i Sanit. 1951, (9), 41-6.

Vitamin C stabilizers suitable for addn. to food during or before its prepn. are: starchy foods; protein materials like egg albumin; egg powder and casein; NaCl in acidic foods (sauerkraut, vegetable soups); and sucrose at 20% or higher concn. in preserves. Even 3% glucose shows a

stabilizing affect. The effects show up better at 10 mg. % concn. of the vitamin than at lower levels (5 mg. %).
CA, V. 46, 1952: 4140d

CHARLAM POWICZ, Z.; SOBIECH, W.
Vitamin P and C content in raw white cabbage and sauerkraut. (Wyzsza Szkola Rolnicza, Poznan, Poland). Zeszyty Probl. Postepow Nauk Rolniczych 1965, 53, 117-19 (Pol).

The vitamin P (I) content was highest in white-head and brussel varieties (69 and 52.5 mg. %. resp.). I decreased 50% during lactic acid fermentation and~20% during storage for 9 weeks at 8-10°. Storage decreased the vitamin C (II) content 60%. I in com. products ranged from 24.6 to 39.8 mg. %, and II from 4.4 to 40.5 mg. %. The ascorbic/dehydroascorbic acid ratio was 3: 1 and 1.2: 1 in fresh and com. cabbage, resp. I was unaffected and II was 29.5% lower in 2nd-than in 1st-grade cabbage. In com. sauerkraut, the av. I content was 32 mg. %, and that of II 23 mg. %.
CA, V. 64, 1966: 4170e

CHMIELNICKA, J.; GRABSKA, K.
Determination of lactic acid in sauerkraut. Roczniki Panstwowego Zakladu Hig. 1965, 16(3), 299-302 (Pol).

The Koch and Bretthauer method (CA 45, 7293d), which allows detn. of lactic acid in the presence of other org. acids, was used. The percent of lactic acid increased from 0.062 to 1.583 in 30 days. pH decreased during the same time from 5.6 to 4.1.
CA, V. 63, 1965: 12233e

CHUNG, D.H.
Studies on the Composition of Kimchi. III. Oxidation-Reduction Potential during Kimchi Fermentation. Kor J. Food Sci. Technol. 1970, 22, 34-37. Fig. 5 Tab. 1 Ref. 25.

The variation of acidity, pH and oxidation-reduction potentials of Dongchimi (a kind of large raddish pickle) during its fermentation was investigated. Estimation of oxidation-reduction potentials was carried out by the electric method.

1. Acidity was increased-3.5% by lactic acid and pH was decreased 3.4% during Dongchimi fermentation.
2. In Dongchimi, oxidation-reduction potentials was comparatively high (pH above 10) in the earlier state and then decreased rapidly from pH 15 to 2.0 but slightly increased pH 5.0 in the later stage of the fermentation.
3. It is suggested that the earlier stage of fermentation was more aerobic condition than the later stage.

Korean Sci. Abstr., V. 3, 1971: 107

DILLER, H.
Quality determination of sauerkraut. Z. Lebensm.-Untersuch. u. -Forsch. 1950, 90, 180-7.

The compn. of 52 samples of sauerkraut was: moisture 89.7-94.0, protein 0.78-1.77, fat 0.04-1.28, carbohydrates 0.66-5.46, crude fiber 0.63-3.64, NaCl-free ash 0.42-0.74, NaCl 0.26-2.34, lactic acid 0.48-1,44, volatile acids 0.04-0.25, sugar 0.08-2.32%, vitamin C 0.6-25.4 mg. %, alc. 0.84-2.06%, acid: sugar ratio 1:0.08 to 1:4.08. The detailed analytical data are classified for 4 grades of sauerkraut. The literature on judging the quality of sauerkraut by organoleptic and chem. methods is reviewed. 20 references.
CA, V. 44, 1950: 5494f

EGIAZAROV, G.M.
After-effect of ionizing radiation on vitamin C and carotene contents in certain preparations and foods. Voprosy Pitaniya 1958, 17(5), 9-11.

Vitamin C and carotene (I) present in vitamin pills, sauerkraut, and tomato paste did not undergo any change following γ-ray irradiation from 100,000 to 300,000 r. However, I content in oil prepns. decreased considerably due to the induced oxidn. of vegetable oil used as the carrier of I.
CA, V. 53, 1959: 19189f

EGIAZAROV, G.M.
Radiosynthesis of vitamins C and B, in some food products. Doklady Akad. Nauk S.S.S.R. 1959, 128, 1070-2.

Various food products (potatoes, carrots, sauerkraut, tomato paste, flour, barley) were exposed to Co^{60} radiation at 5-8° with up to 150,000 r. total dosage. Food products normally regarded as vitamin C (I) carriers underwent a proportional loss of I if the foods were in the preserve from; fresh vegetables, on the other hand, actually showed an increase of I. Vitamin B_1 suffered similar changes and in barley showed a significant increase after irradiation with 50,000 r.
CA, V. 54, 1960: 14489e

FINOGENOVA, N.V.; NIKOLAEV, R.P.
The vitamin C content of some fruits and vegetables. Trudy Vsesoyuz. Nauch.-Issledovatel. Vitamin. Inst. 1953, 4, 189-92.

Fruits and vegetables reaching Moscow hospitals as a rule are high in vitamin C. Under storage conditions (during the winter months) there occurs a drastic fall in the vitamins of some foods. In fresh young potatoes vitamin C is 19.4 mg.%. It drops during storage to 1.9 mg.%. In white cabbage the vitamin C content is 60.4, in cauliflower 88, in turnips 45, in tomatoes 25.5, in parsley 44.6, in blackberries 203.4, in lemons 124.9, in sauerkraut 42.4, in lettuce 22.0, in onions 36.9. In cabbage, turnips, beets, and parsley the vitamin is well maintained during storage. The loss of vitamin C in wilted vegetables may be as high as 100%. Dried berries lose much, while frozen blackberries retain most, of their original vitamin C.
CA, V. 49, 1955: 9186d

FLORIN, U.
Olfactory analysis of freeze-dried vegetables. Ind. Obst Gemueseverwert. 1969, 54(23), 680-4; 1970, 55(1), 12-15 (Ger).

Freeze drying slightly degraded the aroma, taste, and consistency of strawberries, onions, and sauerkraut, and extensively degraded the aroma and consistency of cauliflower.
CA, V. 73, 1970: 108380v

GEYER, J.; MARTENS, F.
Quantitative analysis of sauerkraut. I. Sampling and work-up of analytical samples. (Lab. Firma Rich. Hengstenberg, Esslingen/Neckar, Ger.). Deut. Lebensm.-Rundsch. 1969, 65(6), 172-3 (Ger).

It is recommended that sauerkraut samples should be thoroughly homogenized before aliquots are taken for anal. rather than being pressure strained. Values for vitamin C, total acid, salt, and sugar are lower when expressed as wt./kg. than when expressed as wt./l. of strained material.
CA, V. 71, 1969: 90066u

HAHN, F.V.v.
The true antiscorbutic vitamin content of German foods. Z. Volksernährung Diätkost 1932, 6, 337-41, 364-6, 372-3; 7, 5-6. Chem. Zentr. 1932, I, 1262.

One guinea pig unit (ME) was defined as the daily dose of food in g. necessary to keep the pig healthy. Fruit was found to be much poorer in vitamin C than older work had indicated. Black currants showed 200 ME, strawberries 100, raspberries and gooseberries 50, red currants 33, apples about 10, pears and quinces in winter practically none, oranges and lemons 200, mandarins 50, bananas and pineapples 16, dates and figs little, and haws (after cooking) 100. A large no. of culinary plants were investigated, both raw and cooked, their stage of maturity also being considered. Results showed carrots 10, red cabbage 100, cooked about 15, white cabbage somewhat less, sauerkraut still less, spinach 16, cooked none, turnip 200, cooked about 30. Cabbage salad showed less than 20, endive salad about 20; raw beets, celery and onion were poor in the vitamin. Chives were rich (100), as were parsley (200) and horseradish (200), after cooking 50. Tomatoes showed only 20.
CA, V. 28, 1934: 197^9

HYUK, H.K.
Studies on nitrosamine (1). Contents of nitrite and nitrate in Korean foods (Kimchi) and Human Saliva. Kor. J. Nutr. 1974, 7 (4), 21-23.

Nitrite, one of the precursors of dimethylnitrosamine distributes widely in natural foods and also when used as a color fixative in meat products. In this paper, nitrites and nitrates content in Korean-Kimchi and Human Saliva were as follows:
1. pH: 3.8∼5.8 (in Korean-Kimchi soup)
2. NaCl: 1.5∼3.1% (in Korean-Kimchi soup)
3. Acidity: 0.38∼0.62% (in Korean-Kimchi soup)
4. NO_2- { 0.25∼0.68ppm (in Korean-Kimchi)
1.9∼5.0ppm (in Human Saliva)
5. NO_3- { 35.0∼92.0ppm (in Korean-Kimchi)
7.6∼28.0ppm (in Human Saliva)

These results showed low contents in Korean-Kimchi and Human Saliva.
Korean Sci. Abstr., V. 8 (1) 1976: 119

JEDRZEJCZYK, H.
Vitamin C preservation in sauerkraut during its production, storage, and discribution. (Warsaw, Pol.). Przem. Ferment. Rolny 1974. 18(11), 12-15 (Pol.).

In testing samples through the various stages of prepn. beginning with cabbage from the fields, it was found that much of the sauerkraut available com. had lost considerable vitamin C. Immediate salting and stamping down of the cut cabbage are very important. Mech. emptying of the barrels in order to minimize exposure to air is recommended. Losses of vitamin C in polyethylene bags stored at 18-20° and not protected from light were the same as in the barrels. When the polyethylene bags were stored at 6° and protected from light vitamin C was preserved to a much higher degree and a much longer time.
CA, V. 83, 1975: 7485j

KAWADO, T.
Vitamin content of pickles. I. The change of vitamin C in salt-pickled cabbage and miso-pickled cucumber. (Tokyo Agr. Coll.). Shokuryo no Kagaku (Sci. of Foods). 1948, 2, 254-5.

Vitamin C of pickles was destroyed rapidly. Only 38% was retained in salt-pickled cabbage after 10 days, and 17% was retained in rice bran-miso-pickled cucumber after 5 days. The suitably pickled cabbage and cucumber contained 25 and 10 mg. % vitamin C, resp.
CA, V. 47, 1953: 2395d

KIM, H.O.; RHEE, H.S.
Studies on the Nonvolatile Organic Acids in Kimchis Fermented at Different Temperatures. Kor. J. Food Sci. Technol. 1975, 7 (2), 74-81, 11 fig. 4 Tab. 34 Ref. (Article in Korea)

Nonvolatile organic acids were determined raw chinese cabbage, Kimchis fermented at 6°~7°C and at 22°~23°C. Total acids were isolated by ion-exchange chromatography and quantitative determination of individual acids was performed by silicic acid partition column chromatography. Acids were identified qualitatively by paper chromatography. Palatability of Kimchis was evaluated by nine pannels. Results were as follows: Maleic, fumaric, lactic, succinic, malonic, oxalic, glycolic, malic, citric, tartaric, sulphuric and phosphoricacid were found in raw chinese cabbage, Kimchis fermented at 6°~7°C, and at 22°~23°C. In raw chinese cabbage, most of organic acids were in salt form and malic acid was highest in amount. In Kimchi fermented at 6°~7°C, the amount of lactic acid and succinic acid was higher than that in Kimchi fermented at 22°~23°C, and, tartaric, oxalic, malic, malonic, maleic, glycolic and fumaric acid were less than those in Kimchi fermented at 22°~23°C. Kimchi fermented at 6°~7°C had a more flavorous sour taste than Kimchi fermented at 22°~23°C.
It is assumed that larger amount of lactic acid and succinic acid in Kimchi fermented at 6°~7°C have a connection with flavorous sour taste.
Korean Sci. Abstr., V. 7, 1975: 668

KYZLING, V.; BERAN, J.

Loss of vitamin C during the fermentation and storage of sauerkraut. (Vysoká škola zemědělská, Brno, Czech.). Průmysl Potravin 1954, 5, 120-3.

The greatest losses caused by adsorbed 0 occur before the fermentation gets started. Later on vitamin C (I) is protected by the products of the reductive lactic fermentation and the breakdown is considerably slowed down. Afterwards it is accelerated again. The content of I in the liquid juice is much more affected than in the leaves. The use of pure cultures of lactobacilli warranting a fast fermentation, washing, and close packing of the material are recommended. Access to 0 and contact with Fe must be avoided.The pH is maintained between 3.5. and 3.8 and must never rise above 4.0. Temp. of about 10° aids in suppressing the microbial competition. When following these conditions, products of good antiscorbutic values are obtained.
CA, V. 48, 1954: 14031g

LAVRON, B.A.; YARUSOVA, N.

Sauerkraut as a source of vitamin C. Biochem. Z 1930, 229, 115-27.

Hay and oats which have been autoclaved invariably produce typical scurvy in guinea pigs receiving this as their basic diet. Addn. of sauerkraut to such a basic diet inhibits the development of the disease process, 30 cc. of the juice being required for a prophylactic dose. If it is assumed that the amt. of vitamin C present in the min. prophylactic dose of a definite product is a vitamin unit, 1 kg. sauerkraut juise contains only 33 units, 1 kg. sauerkraut 26 units while apple juice (cider?) will contain 330 to 660 units per kg.
CA, V. 25, 1931: 1560

LEE, T.Y.; KIM, J.S.; et al.

Composition of Kimchi. II. Variations of vitamins during Kimchi fermentation. Bull. Sci. Research Inst. (Korea) 1960, 5(1), 43-50.

Kimchi is a group designation for salted and fermented acidic vegetables produced with the participation of microorganisms. Found in Kimchi are citric, succinic, lactic, pyruvic, gluconic, malic, fumaric, and unidentified acids. In the present study, an attempt has been made to clarify the nature of microbial incorporation as well as the variation of vitamins in the Kimchi processing. During the course of Kimchi fermentation, the variations of total acid, pH, glucose, thiamine, riboflavin, niacin, carotene, ascorbic acid, and vitamin B_{12} have been investigated. After slight decrease in vitamin content at the early stage of the fermentation, all of the B vitamins have increased and reached their max. level, twice the contents of the original raw Kimchies, when the fermentation proceeded to the point showing the best taste and flavor. It is by a decrease of the vitamins upon the development of acids.
CA, V. 54, 1960: 18869h

MAKHKAMOV, G.M.; MEN'KOVICH, V.Y.; et al.

Cabbage as a source of vitamin C. Tr. Inst. Kraevoi Eksperim. Med., Akad. Nauk Uz. SSR 1962, (4), 114-19.

Vitamin C (I) was detd. in 345 samples of fresh and fermented cabbage of the Uzbekistan varieties. In white cabbage I was min. in May (early) and max. in the fall (late varieties). During cabbage storage from Oct. to Dec. I loss was 43%; in Jan. and Feb. I decreased by 62 and in March by 73%. I in the fermented cabbage was always higher than in the samples of stored cabbage. In order to increase I and inhibit growth of lactic acid-forming bacteria in the fermented cabbage, 25 mg. I and 5-10 g. of red peppers/100 g. of cabbage were added before fermentation. The fresh cabbage before fermentation contained 58.7 mg. % I. The fermented cabbage retained 42-50 mg. % I after 5 months.
CA, V. 60, 1964: 6131e

MARKOV, A.P.
Vitamin C value of frost-resistant leaf cabbage. (Village Krestsy, District Novgorod). Voprosy Pitaniya 1955, 14(3), 45-6.

The amt. of vitamin C (I) in head cabbage is 25-100 mg.%; in sauerkraut (with salt brine) only 40% of the original value is present. The frost-resistant leaf cabbage grown in the Northern regions of the U.S.S.R. contains in some instances 201 mg. % of I. This cabbage can remain in the garden at -10 to -17° without losing its vitamin content.
CA, V. 49, 1955: 16256e

MARKUZE, Z.
Vitamin C content of sauerkraut. (oddzial Badania Zywnosci i Przedmiotow Uzytku Filii P.Z.H., Lodz). Roczniki Panstwowego Zakladu Hig. 1951, 2, 112-25 (English summary).

The vitamin C content of 17 samples of different sauerkraut prepns. varied from 8 to 36 mg. % and of the juices 9 to 38 mg. %.
CA, V. 49, 1955: 9836i

MARTISHENYA, A.I.; TARKHOV, V.S.
Sauerkraut as a source of antiscorbutic vitamin. Trav. acad. militaire med. Armee Rouge U.R.S.S. 1, 357-61; Chem. Zentr. 1936, II, 1197.

After long standing the vitamin C content of sauerkraut is so much reduced that doses of 5,10 and 15 g. were not sufficient to maintain normal growth in guinea pigs. With doses of 20 g. a slight increase in wt. was observed. However, this effect was so slight in comparison to that obtained with other vitamin C-contg. foods that sauerkraut which has been kept a long time (until May, June, July) cannot be regarded as a source of the vitamin.
CA, V. 32, 1938: 3847^7

MAYER, K.; PAUSE, G.; et al.
Analysis of sauerkraut juice. (Sekt. Getraenkechem. Biol. Technol., Eidg. Forschungsanst. Obst. Wein.-Gartenbau, Waedenswil, Switz.). Mitt. Geb. Lebensmittelunters. Hyg. 1973. 64(4), 519-23 (Ger).

In 4 different sauerkraut juices the contents of free amino acids, the concn. of some nonvolatile amines, and other parameters such as pH, Na, K, and total acids were quant. detd. The results were compared with those obtained from a com. grape juice. The concn. of free and essential amino acids was much higher in the sauerkraut juices than in the grape juice. Physiol. objectionable amts. of histamine (>50 ppm) and

tyramine (40 ppm) were the products of lactic acid fermn. Advanced fermn. techniques were suggested for minimizing these undesirable amines.
CA, V. 81, 1974: 76628d

MEHLITZ, A.; GELBRICH, D.
Analysis of commercial sauerkraut. (Tech. Univ. Berlin). Ind. Obst-Gemueseverwert. 1962, 47, 645-52.

A review of the methods of analysis for solids, NaCl, total acidity, sugar, ash, vitamin C, formol value, MeOH, pH, EtOH, Ca, and sp. gr. and results on 54 samples of fresh, foil-wrapped package, and vacuum-packed sauerkraut are given.
CA, V. 58, 1963: 6128b

MIKKI, M.S.; ANAND, J.C.
Physicochemical characteristics of Indian varieties of cabbage and quality of their sauerkraut. (Div. Hortic. Fruit Technol., Indian Assoc. Res. Inst., New Delhi, India). Indian Food Packer 1973, 27(1), 19-23 (Eng)

Five cabbage varieties, presently used for sauerkraut manuf. varied in size of head but very little in compn. From 2 of them (red cabbage and Golden Acre), a better quality sauerkraut could be obtained. Volatile acidity was on the whole low. All sauerkraut samples showed appreciable loss of vitamin C.
CA, V. 79, 1973: 135458g

MROZEWSKI, S.; PIJANOWSKI, E.; et al.
Investigations on varieties of fresh and stored cabbage, and of sauerkraut. Przemyst Spozywczy 1956, 10, 69-72 (English summary).

Chem. analyses reveal a remarkable uniformity of compn. in different varieties of cabbage. Four months' storage in stacks results in decrease of dry substance from 10% (for fresh cabbage) to 8.2%, of sugar from 5.2 to 4.0%, and of vitamin C from 46 to 29 mg.%. Sauerkraut has 26 mg.%. vitamin C, low acidity (1.25%). 1% nonfermented sugar, and comparatively high alc. content (0.8%).
CA, V. 50, 1956: 14998h

NEUSBAUM, C.W.
Simple test for salt in tomato juice and kraut. Canner 1941, 93(21), 12-13.

Titration with 0,1 N $AgNO_3$ with Na_2CrO_4 indicator is most accurate, but a simplified modification of this procedure in which drop tests are used is sufficiently accurate for foodpacking plants. The method is given in detail.
CA, V. 36, 1942: 3572^5

NICOLAISEN, W.
Methods for determination of quality of sauerkraut. (Tech. Hochschule, Hannover, Ger.). Ind. Obst-u Gemüse-Verwert 1955, 40, 477-8.

Phys. and chem. methods are reviewed.
CA, V. 50, 1956: 2089a

OL'SHANOVA, K.M.

Chromatographic qualitative method, applicable in analyses of food products. Trudy Moskov. Tekhnol. Inst. Myasnoi i Moloch. Prom. 1955, (5), 48-53.

A time- and reagent-saving qual. method is given for the 3rd, 4th, and 5th classical analytical groups. The ions are sepd. chromatographically and identified chemically. The min. concn. required to identify all cations is 0.0078N. The method is used to identify Cu, Pb, and Sn in canned meat with tomatoes and kraut, ice cream, cheese, butter, and dry and condensed plums.
CA, V. 51, 1957: 7221e

PADERINA, V.P.

Vitamin activity (C, carotene) in fermented and salted vegetables. Zdravookhran. Kazakhstana 1958, 18(6), 52-5.

Changes in ascorbic acid (I) during fermentation and freezing of cabbage and salting of tomatoes are reported. Freezing of cabbage with subsequent thawing caused a significant loss of I, early varities showing a greater loss than medium and late varieties. Sulfiting paste made from salted tomatoes improved the storage retention of I.
CA, V. 54, 1960: 13485h

PEDERSON, C.S.

Relation between quality and chemical composition of canned sauerkraut. N.Y. Agr. Expt. Sta., Bull. 1940, 693, 3-15; cf. C.A. 30, 6078^1.

An examn. for quality factors and chem. compn. was made on 332 samples of com. canned sauerkraut produced in the U.S. In general, the samples of poorer kraut showed some abnormality in chem. compn., many of them contg. less than 1.0% lactic acid or more than 2.5% NaCl or less than 1.5% NaCl. The better-quality krauts showed a higher av. vitamin C content. The samples contg. between 1.5 and 2.5% NaCl were usually of firm texture as compared with krauts contg. less or greater amts. of NaCl. The salometer is not a reliable instrument for detg. the NaCl content of sauerkraut. The ascorbic acid content varied from 0 to 0.39 mg. per g. About 25% of the samples contained more than 0.23 mg. per g., and 25% contained less than 0.14 mg. per g. Normally good canned kraut contains 0.15-0.30% volatile acidity, and 1.5-2.0% total acidity calcd. as lactic acid. The amt. of alc. present depends upon the extent of yeasty fermentation. In canned kraut the amt. of alc. is 0.10-0.30%. In general, yeasty krauts are of poor quality.
CA, V. 35, 1941: 219^7

PEDERSON, C.S.; KELLY, C.D.

Quality of commercial sauerkraut. N.Y. Agr. Expt. Sta., Bull. 1932, 613, 3-14; cf. C.A. 26, 799-.

In sauerkraut an abnormal NaCl content results in abnormal texture and otherwise influences quality. Optimum NaCl content is 2-2.5%. A definite relationship of quality to the chem. analysis was noted. More care in regard to control of surface fermentation and in the packing of the product, as well as in the use of quant. methods of examg. salt content and acidity, would improve the quality of com. sauerkraut. Detn. of volatile acidity is not useful in detg. kraut quality. If the alc.

content exceeds 0.3% secondary fermentations have probably occurred. Canned sauerkraut should have a min. total acidity (lactic acid) of 1.2%.
CA, V. 27, 1933: 349[6]

PEDERSON, C.S.; MACK, G.L.; et al.
Vitamin C content of sauerkraut. Food Research 1939, 4, 31-45.

The vitamin C content of sauerkraut was studied in relation to the original cabbage, changes taking place during fermentation, during storage, during canning and after packing in barrels. The ascorbic acids contents of the various samples were detd. by titration with 2,6 dichlorophenol-indophenol. Raw kraut obtained during, and immediately after fermentation in the large, com. size vats contains approx. the same amt. of vitamin C as the original cabbage. During storage in the vats after fermentation, the content of vitamin C slowly decreases. Canned kraut contains less vitamin C than raw kraut. Kraut repacked in barrels loses vitamin C. The loss was more rapid in barrels stored at low temps. 1°, than at higher temp., 20°, where fermentation could continue. The loss of vitamin C in kraut is assocd. with the loss of CO_2 after fermentation is complete.
CA, V. 33, 1939: 6466[6]

PEDERSON, C.S.; WHITCOMBE, J.; et al.
The ascorbic acid content of sauerkraut. (New York State Agr. Expt. Sta., Geneva). Food Technol. 1956, 10, 365-7.

The ascorbic acid content of 217 samples of canned sauerkraut ranged from 35 to less than 1.0 mg. %. Ascorbic acid detns. of sauerkraut in vats indicated that the temp. of filling the vat and the storage time in the vat had a marked influence upon the ascorbic acid content. Temp. and storage time influenced the retention of ascorbic acid in the canned sauerkraut.
CA, V. 50, 1956: 15987b

PEYER, W.; BREINLICH, J.
Chemical investigation and evaluation of crude plant juices and similar preparations. Suddeut. Apoth. Ztg. 1938, 78, 790-4, 809-12, 819-20, 827-8, 833-6, 882-7.

The chem. and phys. characters of the juices and residues were detd. in connection with studies on pasteurization and keeping qualities, capillary pictures and luminescence analyses. Among the prepns. particularly described and characterized are those of garlic (Allium sativa), "Burlauch" (Allium ursinum), onion (allium cepa), horseradish (Cochlearia armoracia), celery (Apium graveolens), sauerkraut and carrots (Sorbus aucuparia and domestica).
CA, V. 33, 1939: 1095[7]

POVOLOTZKAYA, K.L.; BUKIN, V.N.; et al.
Sauerkraut as a source of antiscurvy vitamin. Bull. Applied Botany, Genetics Plant Breeding (U.S.S.R.), Suppl. 1934, 67, 103-12.
CA, V. 28, 1934: 7317[5]

PROKOF'EVA, A.M.; NIZOV, V.S.
The quality of sauerkraut. Konservnaya i Plodoovoshchnaya Prom. 1940, 11, 14-17; Chem. Zentr. 1941, II, 283.

The increase in lactic acid content depends only on the temp. of the cabbage during fermentation. At const. temp., the fermentation of cabbage without stamping produces a product with a max. of 29.6% sugar and AcOH, and a min. of 1.05% of lactic acid and oleic acid. The acetic and oleic acids are even produced by treatment with pure cultures. This process produces a product with a lower lactic acid (0.94%) and sugar (16.5%) content; hence the only advantage of its use is the least loss in vitamin C.
CA, V. 38, 1944: 1317^6

SCHILLINGER, A.; ZIMMERMANN, C.
Stability of various vitamins in dried potatoes and vegetables. I. Vitamins in stored dried potatoes and vegetables. (Deut. Forschungsanst. Lebensm. Chem., Munich, Ger.). Deut Lebensm.-Rundschau, 1965, 61(2), 45-52. (Ger).

The stability of thiamine, riboflavine, nicotinic acid, ascorbic acid, and β-carotene in stored, dried snap beans, carrots, red cabbage, white cabbage, Savoy cabbage, sauerkraut, potatoes, parsley, leeks, and spinach was detd. Parsley, leeks, and spinach were freeze-dried, and stored in vacuo; the others were heat-dried, and stored under N. All were stored up to 3 years at ambient temps. of 5-28°, and relative humidities of 35-63%. Thiamine, riboflavine, and nicotinic acid were stable even in opened containers, stored for 2 months in the dark in air- and moisture-contg. rooms after opening. Ascorbic acid losses were: after 2 years, beans, 42%, white cabbage, 32, and potatoes, 29; carrots, Savoy cabbage, red cabbage, sauerkraut, parsley, leek and spinach < 13%. After 3 years beans, 50%, white cabbage, 73, Savoy cabbage, 18, red cabbage, 20, sauerkraut, 36, potatoes, 67, carrots, unchanged. No dehydroascorbic acid was found. Moisture and pH had no bearing on the ascorbic acid values. β-Carotene was lost (38-55%) in all samples, except carrots, and parsley.
CA, V. 63, 1965: 4868b

SEDKY, A.; STEIN, J.A.; et al.
Efficacy of added ascorbic acid in the control of discoloration of kraut. (Univ. of Wisconsin, Madison). Food Technol. 1953, 7, 67-70.

Ascorbic acid provided good protection for the color of sauerkraut packed in Pliofilm bags and kept under refrigeration in the dark for 6 weeks. The ascorbic acid was reasonably effective in the presence of Fe but not Cu ions. The ascorbic acid was not effective in retarding discoloration or flavor deterioration when the sauerkraut was exposed to radiation from fluorescent lights; in fact, it apparently accelerated discoloration.
CA, V. 47, 1953: 12690d

SEDKY, A.; STEIN, J.A.; et al.
Factors affecting color and flavor of sauerkraut packaged in Pliofilm bags. (Univ. of Wisconsin, Madison). Food Technol. 1952, 6, 377-80.

The ascorbic acid content of sauerkraut decreased more rapidly in Pliofilm bags when air was present than when the bags were partially evacuated or the air was replaced with N. Discoloration was also greatest when the kraut was packaged with air. Fe and Cu caused discoloration in the presence of air. Cu had a more drastic effect. In the presence of N, Fe had only a slight effect, whereas the Cu continued to catalyze oxidation. The rate of oxidation of ascorbic acid was greater in sauerkraut exposed to fluorescent light than in packages stored in the dark. Visual exam. of the color was found to correlate with the a_L and L values as detd. by the Hunter Color Difference meter. The a_L value of kraut having an acceptable color did not exceed 1.
CA, V. 47, 1953: 12690e

SHORNIKOVA, N.M.
The content of organic acids in pickled and fermented vegetables. Konserv. i Ovoshchesushil. Prom. 1959, 14(7), 28-9.

The detn. of org. acids in pickled and fermented vegetables is of importance for knowing in which direction the fermentation may proceed. The method of Wigner was used for steam distn. of volatile acids (AcOH, butyric). Lactic acid was detd. by titration. Cucumbers, tomatoes, cabbages, sweet peppers, and egg plants were investigated. Among 17 samples tested only 3 showed the presence of butyric acid. These were stored with free access of air and it is assumed that it may account for the acid formation. Of total org. acids present 60 to 85% consisted of lactic while 15-40% of AcOH. In organoleptic evaluation the samples contg. butyric acid received significantly lower scores.
CA, V. 54, 1960: 13485b

TAMBOVTSEVA, L.V.; NIKOLAEVA, L.I.; et al.
Change in vitamin C in white-head cabbage during storage and heat treatment. (USSR). Probl. Tovaroved. Pishch. Prod. Obshchestv. Pitan. 1972, 2, 125-9 (Russ).

The initial vitamin C (I) content in cabbage was 43 mg% in the Amager variety to 36.4 mg % in Belorusskaya. After 5 months of storage in places with natural ventilation. the losses of I were 21-30%, except for the Podarok variety, which lost 4.2%. The losses during cooking in H_2O were lower for the Amager and Podarok varieties. During pickling the I was reduced to 40% of its content in the fresh cabbage, and after 3 months of storage at 4° of the pickled cabbage it was 14.9 and 21.2 mg% for the Podarok and Amager varieties, resp. After cooking, the I content in the pickled cabbage was 6.8 and 8.48 mg%, resp.
CA, V. 82, 1975: 56208j

VAJIC, B.
Vitamin C in sauerkraut and its changes on storage. Z. Vitaminforsch. 1941, 11, 29-42.

The vitamin C content of sauerkraut is maintained for a long time on storage if it is not lost during manuf. In some samples of Jugoslav sauerkraut the vitamin C content was nil, and in others almost as high as in the green plant. It is distributed between the sauerkraut and the brine, the av. vitamin C content of each being 25-30 mg. %.
CA, V. 36, 1942: 2638s

VESNIK, F.

Increased quality control of sauerkraut in commerce. (Zavod Technol. Poljopr. Proizvoda, Poljopr. Fak., Zagreb, Yugoslavia). Hrana Ishrana 1971, 12(5-6), 205-14 (Croat).

The content of juice, NaCl, refractometer value, total acid, volatile acid, Pederson no., sp. wt. without NaCl, ash without NaCl, pH, total ascorbic acid, EtOH, and invert sugar were detd. in 31 samples of sauerkraut. One-third of the samples contained little extractable substance, total acid, ash, NaCl, or ascorbic acid, due mainly to the addn. of water. It appears that this addn. accelerates the chem. destruction process of ascorbic acid.
CA, V. 77, 1972: 3979b

VOGEL, F.; HOSSLIN, R.V.

The influence of cabbage variety and place of growth on the quality of sauerkraut. Bodenkunde u.Pflanzenernahr. 1938, 9-10, 665-95.

From field expts. with 2 varieties of cabbage, grown on 2 soils differing in fertility, with stable manure alone, supplemented with N, only or N, P and K. lab. examn. of the crops and of sauerkraut made in barrel lots therefrom, it is concluded: The quality of sauerkraut depends on the quality of cabbage, which may be influenced by variety, soil, fertilization and season. A cabbage variety which is best for one locality may not be best for another. The expts. was conducted in a dry, sunny year and the fertilization had little influence upon the results. It was observed however, that absolute or relative deficiency in K_2O had an unfavorable effect, and could be recognized in the field by the fired appearance of the outher leaves of the cabbage. The cause of yellow kraut is the higher chlorophyll content of loose-headed, immature cabbage.
CA, V. 39, 1939: 2269^7

VOGEL, F.; KLOPSCH, E.

Influence of cabbage variety and place of growth upon the quality of sauerkraut. II. Bodenkunde u. Pflanzenernähr. 1940, 16, 327-362; cf. C.A. 33, 2269^7.

From further work on the relation of soil, fertilizer and conditions during growth of cabbage varieties to sauerkraut quality, it is concluded: P_2O_5 and K_2O supply in the soil is reflected in compn. of cabbage; max. yields were obtained when manure was supplemented by com. fertilizers carrying addnl. P_2O_5 and K_2O; on soils well stocked with the latter elements, fertilizer N in addn. to manure increased yields without reduction in quality, but on poor soils the one-sided N fertilization reduced both yields and quality. Cabbage varieties show adaptation to particular soils and local growing conditions. An adapted another, the cabbage was higher in dry matter and sugar, kept better in storage over winter, and produced kraut in higher yield and quality.
CA, V. 34, 1940: 8149^3

VOGEL, F.; RADEMACHER, H.; et al.

The dependence of sauerkraut quality upon fertilization of the cabbage. Bodenkunde u. Pflanzenernähr 1939, 15, 191-221; cf. C.A. 33, 2269^7.

The cabbage grown in these fertilizer tests, at 6 and 3 places in the 2 years, was made into kraut by 2 firms, for tests under com. conditions. Notes on the behavior in fermentation and quality of the products are given. Considering all factors, it is concluded that fertilization of the cabbage with both manure and com. fertilizers is practically necessary to assure a good product. Cabbage grown without fertilization fermented "dead," that with manure alone was slightly superior to minerals alone, but not equal to the combination.
CA, V. 34, 1940: 2123^5

WARTH, A.H.
Vegetable juices. The Crown 1941, 30(4), 13, 42.

The presence of minerals, acids and vitamins in carrot, celery, rhubarb, beet, spinach, sauerkraut, asparagus, lettuce and parsley juices and their effect on the human system are discussed.
CA, V. 36, 1942: 1105^6

WYLER, O.
Sauerkraut and sauerkraut juice. Mitt. Gebicte Lebensm. u. Hyg. 1956, 47, 424-31.

The compns. of sauerkraut and pressed sauerkraut juice were detd. While sauerkraut and its freshly pressed juice are a valuable food, the supernatant fermentation liquor is of little value for human nutrition because of low ascorbic acid content.
CA, V. 51, 1957: 9032h

e. Other Influence in the Foodstuff

GIERSCHNER, K.; LIST, D.
Determination of heavy metals in fruit juices. (Tech. Univ. Berlin, Berlin, Ger.). Int. Fruchtsaft-Union, Ber. Wiss.-Tech. Komm. 1966, 7, 159-76 (Ger).

Modifications of the dithizone method and the polarographic method were suggested. Av. contents and limits in mg./kg. were detd. as follows: orange juice Cu 0.57 (0.16-0.95), Zn 1.17 (0.59-2.02), Pb 0.06 (0-0.29); sauerkraut Cu 0.46 (0.15-0.84), Zn 2.68 (2.0-3.96), Pb 0.0; spinach Cu 1.43 (0.21-4.39), Zn 4.87 (2.60-7.38), Pb 0.11 (0-0.28). The metal content of peas in opened uncoated tin cans increased as follows: after opening the cans Cu 0.73, Zn 3.56, Pb 0.12, Sn 4.70; after 24 hrs. Cu 1.15, Zn 6.04, Pb 0.24, Sn 14.20; after 48 hrs. Cu 1.49, Zn 8.93, Pb 0.32, Sn 15.50 mg./kg. The content of Sn in orange juice in opened uncoated tin cans increased markedly after 8 hrs., and reached values between 94.8 and 326.4 mg./kg. after 24 hrs.
CA, V. 70, 1969: 18945s

GORIN, N.; JANS, J.A.
Discoloration of sauerkraut probably caused by a leucoanthocyanidin. (Sprenger Inst., Wageningen, Neth.). J. Food Sci. 1971, 36(6), 943-7 (Eng).

The pink discoloration of sauerkraut was studied. Discolored sauerkraut (DS), potentially discolored sauerkraut (PDS), and normal sauerkraut (NS) were examd. (PDS refers to that portion of a batch of pink sauerkraut, inside the vat, which is not discolored because it has not been exposed to light.) On exposure to uv light, only PDS became pink while the color of NS and DS was not altered. Spectrophotometric curves of HCl exts. of PDS as well as of DS showed a max. absorption at 540 nm. The curves of NS exts. exhibited absorption at 540 nm, but no peak. The pigment of DS was sol. in polar solvents. A specific profile for DS was established by thin-layer chromatog. on silica gel. The compd. responsible for the discoloration appeared to be a leucoanthocyanidin.
CA, V. 75, 1971: 150518n

PEDERSON, C.S.; ALBURY, M.N.; et al.
Effect of salt-acid ratio on quality of sauerkraut. (New York Agr. Expt. Sta., Geneva, N.Y.). Food Packer 37, No. 7, 28, 39, No. 8, 26 (1956).

The quality of sauerkrauts in the salt-acid ratio range of from about 1.1 to about 1.7 were found to be superior to that of kraut showing extreme ratios of salt to acid.
CA, V. 51, 1957: 14158g

PELTZER, J.
Thiocyanate content of white cabbage and sauerkraut. (Landkreises Grevenbroich in Neuss, Ger.) Deut. Lebensm.- Rundschau 1953, 49, 14-15.

White cabbage contained the equiv. of 100 mg. KCNS/100 g. fresh tissue; normal kraut, 10 mg.; discolored canned kraut, 20 mg.
CA, V. 47, 1953: 4517e

VORBECK,M.L.; MATTICK, L,R.; et al.
Volatile flavor of sauerkraut. Gas chromatographic identification of a volatile acidic off-odor. (Cornell Univ., Geneva, N.Y.). J. Food Sci. 1961, 26(6), 569-72.

Low mol. wt. fatty acids, other than AcOH, were responsible for the cheese-like aroma of off-odor sauerkraut. The acids were sepd. by steam distn., and after removal of AcOH, converted to their Me esters and analyzed by gas chromatography. Abnormally large amts. of $EtCO_2H$, $PrCO_2H$, and $AmCO_2H$ were found. A very poor sample also contained Me_2CH CH_2CO_2H and Me_2CHCO_2H.
CA, V. 60, 1964: 4700h

f. Storage and Prevention

BOUTHILET, R.J.
Preservation and stabilization of aromas in foods and drinks. (Snell, Forster D., Inc.) Ger. Offen. 2,003,098 (Cl. A 23bl), 01 Oct 1970, US Appl. 07 Mar 1969; 16 pp.

Aromas in sealed containers were preserved or improved by buffering the redox potential of the head-space gases by means of stoppers contg. metals activated charcoal, ion exchange resins, wood, or

selectively permeable membranes which let gases such as O or H escape. The change in redox potential in bottled wine resulting from exposure to sunlight or heat was prevented by use of a Cu inlay on the stopper. Grape juice and wine showed lower SH content and lighter color than controls after exposure to uv or fluorescent light when protected with inlays of ion-exchange resin (SO_2 form) or ion-exchange resin impregnated with Fe^{3+}. Apple juice was protected from developing a stale flavor with inserts of ion-exchange resins. A disk of activated charcoal was used to prevent the usual development of unpleasant odor in sauerkraut. Coffee having superior aroma after 6-month storage was attained with an insert of charcoal satd. with coffee ext. Wine comparable in character to that aged 3 years was achieved without aging by using an insert of pulverized white oak.
CA, V. 74, 1971: 41282q

GRAHAM, W.E.
The canning of sauerkraut. The Crown 1941, 30(3), 39-49.

The prepn. for canning and filling into cans are discussed. The brine should be adjusted to give the finished canned product approx. 1.25% acidity and 2.0-2.25% salt content. Sauerkraut is extremely corrosive; hence cans from corrosion-resistant Sn plate must be used. Sauerkraut contains a small but significant amt. of S-bearing proteins. During heating in the presence of acids and O these proteins are broken down, liberating gaseous S compds., which combine with the interior Sn coating of the can to form black SnS. A certain amt. of this discoloration is normal and not objectionable. Its formation can be kept at a min. by giving the kraut a long exhaust, which ensures a high closing temp. and a high final vacuum and moreover diminishes the oxidative discoloration of the kraut during the sterilization period subsequent to closing.
CA, V. 36, 1942: 1105^9

KATONA, F.; GARAI, T.; et al.
Determination of the sodium chloride level in canned foods by an automatic coulometric method. (Budapest Vet. Inst., Budapest, Hung.). Konserv. Ovoshchesush. Prom. 1971, 26(9), 39-41 (Russ).
An automatic app. developed by Pungor, et al. (1967) was used. Cl^- content in the soln. is detd. by pptn. with $Ag+$, obtained electrolytically. The detn. takes about 5 min, and can be used in the ug range. The content of NaCl in some samples was: sauerkraut 18.2 g/l.; dessert cucumbers 10.2 g/l.; tomato puree 0.37%. The reproducibility was 0.5-1%.
Ca, V. 76, 1972: 57817v

KOMAROVA, L.; NAVRAT, K.
Content of L-ascorbic acid in canned sauerkraut. (KHES Jihomoravskeho Kraje, Brno, Czech.). Cesk. Hyg. 1968, 13(3), 185-90 (Czech).

Unsuitable packaging, esp. in polyethylene bags, reduced the vitamin content from the usual 9-10 mg. % to 2-6 mg. %.
CA, V. 69, 1968: 34727g

KOVAL'SKAYA, L.P.; BUSHKANETS, T.S.; et al.
Pasteurization of sauerkraut with γ-rays. Konserv. i Ovoshchesushil. Prom. 1961, 16(6), 9-12.

The storage period of sauerkraut (I) was increased by 2-3 months, when it was treated with γ -rays generated from radioactive Co. Freshly prepd. I contg. 0.7-0.8% lactic acid and low in microorganisms with a min. of yeast cells was packed in its own brine under vacuum in sealed containers and exposed to γ-rays of 500,000 rads at 20°. Pasteurization under the above conditions produced a high-grade product with only a small loss in vitamin C, a negligible decrease in peroxidase activity, and a dependable control of gas-forming bacteria.
CA, V. 56, 1962: 1813f

LEE, C.Y.; KIM, H.S.; et al.
Studies on the manufacture of canned "Kimchi". J. Kor Agr. Chem. Soc. 1968, 1 (33-38) Fig. 6 Tab. 4 Ref. 11.

In order to determine proper conditions for the manufacture of canned Kimchi, a heat resistant lactic acid bacteria, the most acid producable strain, was isolated and identified as Lactobacillus plantanum. D-value for the isolate was calculated at 3 from a thermal death curve made at 60°C. The effects of acidity of Kimchi and the amount in a can, and the ratios of solid-liquid, were investigated. The most suitable time for sterilization with a type of can was determined as 25.2 minutes at 85°C. However, in the period of heat treatment the quality was badly affected and this fact made desirable introducing of an adequate preservative additive into the manufacture of canned Kimchi.
Korean. Sci. Abstr. V. 1, 1969: 107

LIPPERT. F.; BRUEGEL, W.
Procedure for keeping the natural purity and improving the stability of pasteurized sauerkraut packed hermetically in plastic bags. (Harrer, Chr., und Otto Fett, Konserven-Union G.m.b.H. und Co. K.-G.) Fr. 1,536,918 (Cl. A 231), 02 Sep 1968, Ger. Appl. 12 Dec 1964-30 Apr 1965; 4 pp.

Fresh sauerkraut and natural sauerkraut juice are packed in foil bags, coated inside with a plastic film. The bags are closed and pasteurized at 70-5°. A suitable bag is Al foil coated with polypropylene. Better packages are made of 3 layers: polypropylene, Hostaphan, and foil. The packages may be kept for $>$6 months with the nutritional value unchanged without the necessity of protecting from heat or light.
CA, V. 72, 1970: 11503d

MALAKAR, M.C.; BANERJEE, S.N.; et al.
The effect of canning and storage on the nutritive value of some common vegetable. I. Changes in ascorbic acid in cabbage. (Univ. Coll. Sci. Technol., Calcutta). Indian J. Med. Research 1955, 43, 23-9.

The effect of canning and storage on ascorbic acid (I) in cabbage was studied. About 20% of the I in cabbage was lost owing to blanching; an addnl. 8% was lost during the holding of the blanched samples exposed to air for 1 hr. The most severe loss of I in cabbage occurred during autoclaving; this loss amounted to 64%. About 25% of the I that remained in the can after autoclaving was lost during the first week of storage at room temp. There was no further loss up to end of two months, but at the end of 6 months no I was found in the can. About 36% of the total I

after addn. of 100 mg. of I to fortify the product was lost during autoclaving; the loss rose to 56% after 6 months' storage.
CA, V. 49, 1955: 9186i

PEDERSON, C.S.; ROBINSON, W.B.
The quality of sauerkraut preserved in tin and glass. (New York Agr. Expt. Sta., Geneva). Food Technol. 1952, 6, 46-9.

A comparison between total acid, salt, ascorbic acid, and Hunter color values and ratings was made upon samples of com. sauerkraut. Sauerkraut packed in tin retained its color and ascorbic acid content better than sauerkraut packed in glass jars. Sauerkraut deteriorated rapidly at high storage temp.
CA, V. 46, 1952: 7676c

PETROV, S.; SHABAKLIEVA, Z.; et al.
Possible uses of tin electroplates in the canning industry. (Bulg.). Nauch. Tr., Nauchnoizsled. Inst. Konserv. Prom., Plovdiv 1972, 9, 303-12 (Bulg).

Cans made of electrolytic tin plate and coated with enamel at 22.4 g/m^2 held stuffed cabbage, pork, stewes apricots, sauerkraut, apples, and pickled peppers for 1 yr without corrosion. Stewed strawberries and peaches did not keep well in the enamel-coated cans.
CA, V. 81, 1974: 89939f

V FERMENTED FISH

a. Method of Preparation

BAENS-ARCEGA, L.
The manufacture of sauce. Manila, National Institute of Science and Technology, July 1969. 12p. 13 refs. (Technical bulletin no.9)

The manufacture of fish and soy sauces are briefly discussed. Studies conducted by the National Institute of Science and Technology (Manila) on fish sauce manufacture showed that fish digestion may be accelerated and hydrolysis may be completed in only 1 wk under controlled conditions. Also Stelephorus sp. and Decapterus macresoma fish species gave quality tasting sauces. In the manufacture of soy sauce, the optimum temp. for protease production is 22-27°C, for a Philippine strain of Aspergillus oryzae, depending upon the medium used for growing the mold.
Phil. Abst. 1970. V. 11 (3-4) 278

BAHR, O.; WILLE, O.
Salting fish. Institut fur Seefischerei, Ger. 566,393, Sept. 30, 1935 (Cl. 53c. 3.03).

Fish-salting processes are improved by addn. of a phenol. Thus, 0.1-0.2% of hydroquinone may be added to the salt used.
CA, V. 30, 1936: 532^7

CHEMISCHE FABRIK. COSWIG-ANHALT GmbH
Preserving herrings. (Johann A. Muller, inventor). Ger. 675,015, Apr. 27, 1939 (Cl. 53c. 2).

Herrings are preserved by means of rock salt to which 0.5-5% of a water-sol. salt of Mg has been added.
CA, V. 33, 1939: 557^3

DALAUDIER, J.G.
Apparatus for pickling foods. Neth. Appl. 6,605,703 (Cl. A 23b, Oct. 31, 1966; Fr. Appl. April 28, 1965; 18 pp.

An automatic app. is described for pickling meat, fish, etc.
CA, V. 66, 1967: 54389q

FIGUEROA, W.S.
Fisheries division, Dept. of Agriculture and Commerce, preparation of fish sauce (patis). Food Production Series 1946, Leaflet No. 9.

Fish sauce, locally known as "patis" is a common item in the Filipino diet. It is a product prepared by autolytic digestion and ageing of salted fish over a long period. The final product is a clear yellow liquid with a palatable and appetizing flavor and aroma. Commonly used raw materials are sardines, anchovies, ambassids and small shrimps locally known as alamang. Gizzard shad is said to produce the best "patis".
Nutr. Related Topics, 1953: 47

FUKUMI, T.; NAKAMURA, M.
Manufacturing techniques of kamaboko using pollack meat as material. Influence of pH on kamaboko-forming ability. (Hokkaido Cent. Fish.

Expt. Sta., Yoichi, Japan). Hokusuishi Geppo 1969, 26(6), 984-9 (Japan)

The pH of pollack (Pollachius virens) fish paste with addn. of sugar, NaCl, starch, and Na glutamate was adjusted to 5.8-7.6 with HCl and NaOH. The pastes were incubated at 20° for 22 hr and then steam-heated at 90° for 40 min to prep. kamaboko (steamed fish meat cake). Changes of jelly strength of the paste during incubation and kamaboko-forming ability (jelly strength and elasticity) after heating were investigated. The jelly strength of the paste increased with increasing incubation time and pH. The paste adjusted to pH 7.3 and incubated for 18 hr had the most favorable kamaboko-forming ability.
CA, V. 73, 1970: 65081d

GOUDOU, A.V.
Nuoc mam or sauce of vietnamese fish. Prod. Pharm. 1962, 17, 424-31 cf. CA 49, 1986d.

A review with 51 references.
CA, V. 58, 1963: 876c

JONES, N.R.
Fish processing. (Food Sci. Technol. Dep., Trop. Prod. Inst., London, Engl.). Prod. Fish-Protein Conc., Rep. Proc. Jt. UNIDO/FAO Expert Group Meet. 1969 (Pub. 1972). 2, 75-98 (Eng). U. N. Publ.: Geneva, Switz.

A review with 74 refs. covering 1918 to 1969. Processing at sea, storage, freezing, canning, salting, drying, fermenting, smoking, and freeze-drying are discussed.
CA, V. 82, 1975: 84519e

MARTIN, C.; SULIT, J.I.
Studies on the preparation of salted fish paste (bagoong) from dried dilis (Stolephorus indicus). Philippine Journal of Fisheries, Jan.-June 1955, v. 3, no. 1, 39-45.

The purpose of this study was to explore the possibilities of using dried dilis as raw material for the preparation of salted fish paste and fish sauce. Before dried dilis can be used for bagoong making it is necessary to soak it first in water so that it would approach its fresh state. Dried dilis was soaked for 24 hrs. in 3 parts of water, then one part salt to four parts freshened fish was added. The mixture was allowed to ferment at temperatures ranging from 37° to 45°C. Analysis of the original dried dilis, freshened dilis and the mixture during the different stages of fermentation were made for protein, moisture and sodium chloride content. There was a gradual increase in the protein content of the fish sauce (patis) up to the twelfth day when the maximum value of 11.53% was obtained. The salted fish paste had a protein content of 15.07% after removal of the patis and addition of concentrated brine. Bacterial counts were very high during the first 24 hrs. of fermentation but the counts decreased during the succeeding days.
Philp. Abstr. Nut. and Related Topics, 1961: 224

NIELSEN, S.S.; BOHMER, T.
The slightly salted herring, "rakorett." Kgl. Norske Videnskab. Selskab Forh. 1935, 8, 83-6.

Analysis of 8 samples of "rakorett" are reported. The range of values is: H_2O 69.59-77.39, crude protein 14.48-19.32, NaCl 5.92-10.25 and ether ext. 1.81-4.86%.
CA, V. 30, 1936: 1453^1

NISHIYA, K.
Frozen fish paste as material for fish cakes. (Hokkaido Regional Fish. Research Lab.). Reito 1961, 36, 426-38.

Factors affecting denaturation of fish paste during freezing storage were investigated on pollack. When 1-6% of NaCl was added, the higher the concn. the greater the degree of denaturation. Repeated washing of fish meat with fresh H_2O caused less salting out, raised the f.p., and relatively increased salt-sol. protein, owing to removal of the H_2O-sol. protein. Sugars were efective in retarding the denaturation during freezing storage. Addn. of 3% of various sugars showed the following decreasing order of the effectiveness: sucrose > glucose > galactose > sorbitol > fructose > lactose > maltose. Sugars used with phosphates showed greater effect. pH of frozen fish paste should be maintained at least above 6.5, because further denaturation was slight in pH range 6.5-7.2. Manuf. of frozen fish paste was also described.
CA, V. 55, 1961: 21411i

OKOLOV, F.S.; SHAVSKII, G.
Physicochemical methods for the determination of the quality of salted fish. (Caspian roach, bream, carp, pike). Voprosy Pitaniya 1936, 5(6), 101-14

H_2S, Nessler reagent, I and indole test were used
CA, V. 31, 1937: 5889^5

PERSHIN, I.V.
Electrochemical determination of the stability of herring salted at the fisheries. Trans. VI Mendeleev Congr. Theoret. Applied Chem. 1935, 2(2), 383-4
CA, V. 30, 1936: 7709^5

REAY, G.A.
The salt curing of herring. J. Soc. Chem. Ind. 1936, 55, 309-15T.

Figures and graphs are given to show the changes in weight, H_2O and NaCl contents of herring cured in brines ranging from 4.2 to 25.4% NaCl and in solid NaCl, at 0°. The fish cured in the 4.2% brine showed the greatest increases in weight and H_2O content. That cured in the 25.4% brine showed the greatest increase in NaCl while the fish packed in solid NaCl absorbed less than that in 18.0, 22,4 or 25.4% brine. Such factors as the thickness of the samples, fat content and skin seemed to influence the transfer of salt and H_2O. Test showed that for cures using less than the customary com. practice of 23.8% brine cold storage would be essential. Certain changes in flavor were noted in the lighter cures.
CA, V. 31, 1937: 769^3

SHEWAN, J.M.
Salt-curing of herring. Dept. Sci. Ind. Research (Brit.), Rept. Food Invest. Board 1937, 84-9(1938).

High baterial counts and high values for volatile bases, both in the flesh and pickle, are usually assocd. with "off" flavors and odors Certain floras in lighter cures are to be regarded as agents of spoilage rather than of curing.
CA, V. 33, 1933: 252^7

SULIT, J.I.; SANTIAGO, S.S.
Preliminary report on the studies of salted fish paste. Manila, Department of Agriculture and Natural Resources, 1949, 3-9. (Popular Bulletin No. 29)

The manufacture of bagoong or salted fish paste is an old industry in the Philippines. A means to improve and hasten its manufacture are the main objectives of this study. Dilis was used as raw material in this experiment. It was first washed with sea water, drained, and then salted. The mixture was transferred, preferably to wooden barrels, and the room heated at temperatures between 37° and 45°C. After one week, the finished bagoong may be transferred to clean 5-gallon cans and shipped for export trade. This experiment showed that bagoong can be manufactured in much shorter time. Results also proved that one part salt to three parts fish is a suitable proportion, and that subjecting the mixture to a temperature range between 37° and 45°C provides a good condition for making an improved and sanitary salted fish paste.
Philp. Abstr. Nut. and Related Topics, 1961: 226

SUZUKI, T.
NMR studies of water in fish meat jelly kamaboko. (Japan). Tokaiku Suisan Kenkyusho Kenkyu Hokoku 1973. (75), 47-53 (Japan).

NMR studies showed that kamaboko made from iced croaker and Alaskan pollack contained strongly bound water and another type of water which was more free but not as free as pure water. The freedom of water in kamaboko with added starch was less than that of kamaboko without starch. Jelly strength of the product did not correlate with NMR spectra. Grinding the fish meat with NaCl resulted in loss of water freedom. During gel formation bound water increased, and after jelly heating to give kamaboko some increase in free water occurred.
CA, V. 81, 1974: 24327k

TANIKAWA, E.; AKIBA, M.; et al.
The manufacture of Gyomiso (fermented fish paste). I. Experiments on the manufacture of Gyomiso. Bull. Japan. Soc. Sci. Fisheries 1950, 15, 689-91

Gyomiso is fermented fish paste. Crushed fish meat (75%) is mixed with wheat bran (10%) inoculated with Aspergillus oryzae and salt (15%). This mixt. is kept about 2 weeks at 25-30°. It ripens by action of the autodigestive enzymes of fish meat and the action of the enzymes of A. oryzae. After 2 weeks the mixt. is cooked to stop the action of enzymes. By 3 days after the mixing of fish meat, wheat bran, and salt, the mixture begins to soften. On the 5th day, a bag filled with Japanese cedar wood dust is immersed into the mixt. for flavoring. From the 7th day, the fermentation of the mixt. becomes stronger, and the juice increases. The H-ion concn. of the mixt. was 6 at the beginning, 6.5 during the fermentation, and became 4.5 at the end of the fermentation. If fermentation goes on abnormally, the pH rises above 6.5 and at this time NH_3 is given off. Therefore, when the mixt. reaches pH 5.5, it is boiled to sterilize it and to decrease the water content to 40%. It then blends homogeneously together. The percentage of yield of the products is from 45 to 50.4 of the wt. of raw fish.

II. The chemical changes of fish-meat protein during the ripening of Gyomiso. Ibid. 692-5.

The decompn. of fish-meat protein is most active from the 7th day to the 13th day after mixing the raw materials. From the 14th day the rate of the decompn. slows down. The H-ion concn. of the mixt. decreased soon after the mixing, but increased slowly at the end of the ripening. The quantity of nonprotein N increased rapidly from the 7th day to the 13th day but thereafter remained static. The change in quantity of amino N. which constitutes the greater part of the nonprotein N, was the same and parallel to pH change. Decrease of amino N at the end of ripening was due to ammonification. The ratio of nonprotein N to the total N increased rapidly from the 13th day after the mixing, and slowly thereafter. The ratio of amino N to the total N showed the same tendency, as did also ratio of amino N to the nonprotein N.

III. Relation between the amount of salt added and ripening velocity and the creation of ammonia during the ripening of Gymiso. E. Tanikawa, M. Akiba, S. Akiba, and T. Motohiro. Ibid. 696-702.

If the amt. of salt added was small (less than 10%), the ripening velocity was too high and the mixt. was apt to spoil. The quantity of the amino N was greater the smaller the amt. of salt added in early ripening but it rapidly became ammonia. If salt was more than 13% of the mixt., the quantity of the amino N rose slowly throughout the ripening. When little salt was used, ammonia content was high. The ammonification is probably due to enzymes of Aspergillus oryzae used. Spoilage is indicated when 90 or more mg. of ammonia are present per 100 g. of Gyomiso. The amt. of salt added to the mixt. of raw materials should be above 13%.
CA, V. 49, 1955: 3435

EDA, T.; IWAKUN, T.
Coloring ham, sausage, jellied fish or meat products and other protein foods. (Sanei Chemical Industries, Ltd.) Japan. 7310,546 (Cl. A 231jc), 04 Apr 1973, Appl. 69 90,352, 11 Nov 1969; 3 pp.

A method for producing stable coloring of protein contg. food (e.g. ham, sausage, etc.) by addn. of carminic acid or laccaic acid and alum was developed. These acids formed a chromoprotein by linkage between protein and the PhOH group in the pigment mols. Both K and NH_4 alums were used for color stabilization. For example, a red ice

cream was obtained by adding 0.1 part of 5% carminic acid to a mixt. contg. defatted milk powder 10, cane sugar 15, fresh cream 12, gelatin 0.4, emulsifier 0.3, NH_4 alum 0.05, sodium polyphosphate 0.1, and sodium citrate 0.05 parts after heating.
CA, V. 80, 1974: 36027e

UYENCO, V.; LAWAS, I.
Mechanics of Bagoong and Patis processing. IPFC 4th Proceedings, 210-222.

Soy and maggi sauce, nuoc-mam and patis are compared on the basis of chemical analyses. The differences lie in the source of the protein and in the manner in which it is broken down into its degradation products. Nuoc-mam and patis making are identical in all respects, as in the kind of fish used, the manner of processing, and the nitrogen partition of the nitrogenous substances. Important aspects of the French work on nuoc-mam are brought out in this paper to elucidate on the chemical transformations of the fish proteins in the processing of these products. It is pointed out that the proteins are broken down chiefly by the enzymes of the digestive organs and not through microbiological activity, as has previously been thought of. Microbes in the processing of patis are more of a nuisance in the sense that they generally increase the unwanted ammoniacal nitrogen fraction. A new way of patis making using the acid-hydrolyzate-method is introduced and analysis of the new product is presented. The new method has the advantage of converting any kind of fish flesh into patis, thus making available fish not previously utilized. The breaking down of the fish proteins is accomplished in a few hours as compared with the four or five months required for the traditional manufacture of patis. The authors recommend that the quality of local patis should be standardized, using the nitrogen partition of Rose.
Author.

VARAVEJ, P.
Preparation of fish sauce by a quick process. in Thai Science Bull., 1958, 9, (2), 6-9.

Quick process fish sauces did not have as good an aroma as the traditionally prepared sauce.
Food and Nut. in Thai. Med. Soc. and Tech. Asp. 1950-1970: 329

VARAVEJ, P.; BUNNAG, K.
Thai processed food products. in Procs. 9th Pacific Science Cong., (Nutrition), 1957, 15, 117-24.

Detailed accounts of the preparation by salting, drying and fermentation of fish and soybean products, the preparation of sauces from oil-seed meals and of popular hot-tasting condiments.
Food and Nut. in Thai. Med Soc. and Tech. Asp. 1950-1970: 330

YANAGIGAWA, T.; NISHIDA, Y.
Preparation of protein from herring meal or silkworm pupae. Repts. Imp. Ind. Research Inst., Osaka (Japan) 1936, 16(10), 27-42.

By using H_2O, dil. NaCl or NaOH or 70% EtOH, proteins were extd. from defatted herring meal or silkworm pupae. Dil. NaOH extn. gave the best yield but the diamino acid content is low, most probably owing to a partial hydrolytic decompn. giving rise to NH_3 and humin subtance.
CA, V. 30, 1936: 30047

b. Microorganism

FUJITA, Y.; MIYAMOTO, M.
Brown discoloration in fish jelly products. V. Brown discoloration by reheating. (Food Dep., Ueno Fine Chem. Ind. Ltd., Itami, Japan) Nippon Suisan Gakkaishi 1975, 41(12), 1263-9(Japan).

Achromobacter brunificans AJ-3230, Serratia marcescens UFF-115 and Enterobacter cloacae UFF-107 were inoculated individually into broth media contg. 5% (wt./vol.) D-glucose (50-99-7) and 5% (wt./vol.) homogenized fish meat, and they were incubated at 30° for 3 or 5 days. The culture media turned brown or dark brown when heated at 100° for 3 or 5 min. The same strains of bacteria were incubated individually at 30° for 7 days in culture media contg. 5% glucose. Homogenized fish meat was then added to the culture media at concn. of 10%. The culture fluid turned brown when heated at 100° for 60 min. These strains of bacteria were inoculated individually into broth media contg. carbohydrate at a concn. of 5%, and 5% homogenized fish meat. After 7 days' incubation at 30°, they were heated again at 100° for 7 min. This reheating caused the following discoloration. A. brunificans formed the brown substance in the cultures contg. glycerol or glucose plus homogenized fish meat, while S. marcescens caused the similar discoloration in the cultures contg. D-ribose and D-arabinose (10323-20-3) instead of glycerol. E. cloacae formed the brown substance in the culture media contg. D-ribose (50-69-1) and D-arabinose instead of glycerol.
CA, V. 84, 1976: 72740y

KONDRATOVICS, E.
Fish paste and its biochemical evaluation as fish food. Tr. Latv. Nauch.-Issled. Inst. Zhivotnovod. Vet. 1968, 21, 29-40 (Russ).

The paste, made of residues of the fishing industry (heads, fins, internal organs, small nonstandard fish), contained dry matter 35.15-71.02, crude protein 10.04-38.08 (av. pure protein 16.55%), fat 2.39-30.31%, N-free extractable compds. 1.74-29.92, ash 1.79-15.15, P 0.845-2.410, and Ca 0.370-1.407%. One kg. of the paste contained carotene 3.88-5.42, vitamin B_{12} 0.28-0.81, vitamin A 1.13-15.70, Fe 470.9, Mn 29.7, Zn 57.3, Cu 3.8, and Co 0.42 mg. The dry matter of the paste contained 22 times more Fe than the dry matter of rainbow trout yearlings or 4 times more than carp yearlings; Zn in the paste was 9.5 times higher and 1.6 times lower, resp. The paste contained all the essential amino acids. One hundred g. crude protein in the paste contained (in g.): lysine 9.89, methionine 5.82. cystine 2.50, arginine 8.15, histidine 3.28, leucine + isoleucine 12.75, threonine 7.39, valine 5.96, and phenylalanine 5.77. Thiamine should be added

to the paste if used for feeding pond fish, domestic animals, or poultry.
CA, V. 70, 1969: 36561t

KREUZER, R.
Production of fermenting fish silage. II. Bacterial and chemical processes during ensiling. Arch. Fischereiwiss. 1954, 5, 47-58
Sci. Abstr. 27, Abstr. No. 597(1955).

The breakdown of sugar and the behavior of proteins and volatile bases were investigated during the growth of bacteria in fish silage acidified by bacterial action at 20°. At that temp., bacterial growth is slower than at 25°, but sufficient acid is formed to produce the required acidification if the initial no. of lactic acid bacteria is adequate. Sugar utilization at 20° is unfavorable; up to pH 4.08 about 12% of sugar was used up, compared with only 4.8% at 25°. The fermentation of fish silage should be carried out at temps. which are near the optimum for the lactic acid-producing organisms, e.g. at 25-30° with Lactobacillus plantarum. During ensilage for 15-23 days, the N content of the silage increased slightly at 20° and the content of free amino acids also increased. After 15-23 days the content of volatile bases was 94-124 mg./100 g.; amts. greater than that usually indicated infection with undersirable organisms.
CA, V. 52, 1958: 8408g

KRISHNASWAMY, M.A.; LAHIRY, N.L.
Fish hydrolysates. IV.Microbiological evaluation.(Central Food Tech. Res. Ins., Mysore 2, India). J. of Food Science 1963, 28(3), 358-364.

Microbiological evaluation was made of three experimental fish hydrolysates (peptones) prepared in this laboratory from a fresh-water species of fish, Barbus dubious. Ten selected microbial cultures grown in an inorganic basal medium with and without yeast or meat extract and containing different concentrations of hydrolysates, showed more or less the same growth in all the hydrolysate media. Media containing the hydrosates were sensitive to antibiotics. The hydrolysates were quite suitable as ingredients of culture media for biochemical tests like indole and methyl-red reactions. Controls were two commercial peptones, one commercial proteose-peptone, and one commercial tryptone.
Author.

MORI, K.; NABETANI, O.; et al.
Spoilage of fish jelly products. II. Inner slimy substance in softening spoilage parts of kamaboko produced by Bacillus licheniformis. (Nippon Shinyaku Co., Ltd., Kyoto, Japan). Nippon Suisan Gakkaishi 1973, 39(10), 1071-6 (Japan).

B. licheniformis produced a transparent slime on the soft spoiled spots of kamaboko. The slime was hydrolyzed completely with 0.1N H_2SO_4 at 60° for 60 min. Only fructose was detected in the hydrolyzate. The slime dissolved in cold water, but not in a 65% alc. soln. Studies of its optical rotation before and after acetylation suggested that the slime was levan. Levan was produced by B.

licheniformis in a culture medium contg. sucrose, but not in media contg. glucose, fructose, sorbose, xylose, maltose, or trehalose. It thus appears that B. licheniformis produces levan using sucrose in kamaboko as a precursor.
CA, V. 80, 1974: 13759f

MORI, K.; NABETANI, O.; et al.
Spoilage of fish jelly products. III. Browning of Kamaboko (boiled fish-paste) by Pseudomonas species. (Food Res. Inst., Nippon Shinyaku Co., Ltd. Kyoto, Japan). Nippon Suisan Gakkaishi 1974, 40(9), 959-62 (Japan).

The browning of Kamaboko was investigated microbiol. The causative agent was identified as Pseudomonas, and not Achromobacter brunificans and Serratia marcescens reported previously. The isolated pseudomonad caused the browning of Kamaboko only when glucose or sucrose was present.
CA, V. 82, 1975: 2869g

MORI, K.; SAWADA, H.; et al.
Spoilage of fish jelly products. I. Softening spoilage of film-packaged kamaboko due to Bacillus licheniformis. (Nippon Shinyaku Co., Ltd., Kyoto, Japan). Nippon Suisan Gakkaishi 1973, 39(10), 1063-9 (Japan).

Spot softening spoilage obsd. in film-packaged kamaboko was investigated. The causative agent was identified as B. licheniformis, a contaminant of potato starch. The addn. of sucrose to kamaboko stimulated this type of spoilage, and the addn. of lower fatty acids, such as AcOH, $PrCO_2H$, and capric acid prevented the spoilage.
CA, V. 80, 1974: 13758e

NABETANI, O.; HIRANO, T.; et al.
Spoilage of fish jelly products. IV. Browning of Kamaboko (boiled fish-paste) by Pseudomonas species. 2 (Food Res. Inst., Nippon Shinyaku Co., Ltd. Kyoto, Japan). Nippon Suisan Gakkaishi 1974, 40(9), 963-7 (Japan).

The precursor of the brown substance produced by Pseudomonas isolated from the browning of Kamaboko was investigated. The precursor was derived from glucose. It was acidic and had strong reducing power. It reacted nonenzymically with ω-aminocaproic acid or other acidic amino acids to produce the browning substance. The precursor was probably 2,5-diketogluconic acid or a similar compd.
CA, V. 82, 1975: 2870a

SAISITHI, P.; KASEMASARN, B.O.; et al.
Microbiology and chemistry of fermented fish. (Univ. of Washington, Coll. of Fisheries, Seattle). J. Food Sci. 1966, 31(1), 105-110 (Eng).

Thai fish sauce was investigated relative to odor and flavor development, and the role of bacteria therein. Viable count decreased with fermentation time. Approx. 70% of the bacterial isolates from a 9-month-old sauce were halophiles of Bacillus types. The typical sauce aroma was present in an Et_2O-EtOH-sol. fraction, which on

chromatography gave 2 fractions contg. amino compds. and weakly acidic compds., resp.
CA, V. 64, 1966: 11766g

TABATA, Y.
Applicability of ethanol-assimilating yeast cells and their cell protein as complementary raw material for kamaboko. (Nagasaki Univ., Nagasaki, Japan). Nagasaki Daigaku Suisangakubu Kenkyu Hokoku 1974, 38, 129-34 (Japan).

The addn. of the cells of EtOH-assimilating yeast (Candida) to meat paste of frozen pollack at a 3% level in manufg. kamaboko (steamed fish meat paste) was effective as a supplement. The cells was superior to the cell protein for this purpose. The addn. of the cells at a 3% level was comparable to the addn. of activated gluten at a 3% level or the addn. of starch at a 10% level, in relation to H_2O holding capacity, gel strength, hardness, elasticity, crispness, and breaking stress. However, when the meat paste was of poor quality, the addn. of the yeast was without effect.
CA, V. 83, 1975: 77174f

TABATA, Y.
Aptitude of yeast protein for use as by-material of kamaboko. (Fac. Fish., Nagasaki Univ., Nagasaki, Japan). Nagasaki Daigaku Suisangakubu Kenkyu Hokoku 1974, 37, 29-37 (Japan).

Dynamic viscoelasticity was compared for single cell proteins (SCP) and activated gluten (A-glu) with a 3-D rheometer. Viscoelasticity was difficult to measure at acidic pH, and it increased with pH but decreased above pH 10-11. In alk. peptized solns. (pH 10.5), the shear modulus of protein (SCP_3) from yeast grown on acetate was the highest and that of A-glu lowest. Variations in viscoelasticity with temp. were nearly logarithmic and dissipation factor of SCP_3 was almost indifferent to temp. Addn. of NaCl to SCP_3 and A-glu decreased the viscoelasticities at low concns. but increased them above 0.5M. Proteins from hydrocarbon-grown yeast, which contained far more lipid than SCP_3 and A-glu, showed variable viscoelasticities.
CA, V. 82, 1975: 96651e

TABATA, Y.
Quality of kamaboko prepared by adding yeast protein to brayed fish meat. (Fac. Fish., Nagasaki Univ., Nagasaki, Japan). Nagasaki Daigaku Suisangakubu Kenkyu Hokoku 1974, 37, 39-44 (Japan).

The aptitude of single cell proteins (SCP) for use in the manuf. of kamaboko (fish paste) was examd. by prepg. kamaboko mixed with SCP or activated gluten (A-glu). Panel tests for the viscoelastic properties of the prepn. mixed with protein (SCP_3)of yeast grown on acetate showed better scores than that mixed with A-glu. But prepns. mixed with proteins (SCP_1 and SCP_2) of yeast grown on hydrocarbons showed lower scores. Since A-glu is used in practice, SCP_3 may also become available as an extender for kamaboko. A correlation coeff. of -0.944 was obtained for dissipation factors of viscoelasticity against panels' scores.
CA, V. 82, 1975: 96652f

ZENITANI, B.

Fishery fermentation products. I. Aerobic bacteria in the salted viscera of fish. (Nagasaki Univ.). Bull. Japan. Soc. Sci. Fisheries 1955, 21, 280-3.

The alky. of the deteriorated product was due to the formation of NH_3 by the action of micrococci and Achromobacter. These bacteria assimilated lactic acid, thus decreasing the buffer action of org. acids in the product; citric and succinic acids were not so markedly assimilated by these bacteria. Maturation of the product was mainly performed by micrococci and putrefaction was caused by Vibrio and Achromobacter.
CA, V. 50, 1956: 10943b.

c. Fermentation Studies

ASANO, M.

Special foods in Akita prefecture. V. Quick ripening of shottsuru (fish sauce) at higher temperature with and without salt and the fractionation of peptides in shottsuru. (Akita Univ., Akita, Japan). Akita Daigaku Kyoiku Gakubu Kenkyu Kiyo, Shizen Kagaku 1973, (23), 103-20 (Japan).

Repeated addn. of proteolytic enzyme to the protein sample was more effective for its hydrolysis than was total addn. at the start. In the quick ripening of shottsuru with salt at higher temps., the use of protease gave a higher formol N/total N ratio and better taste than did pronase. Fractionation of peptides in sandfish shottsuru by mol. sieve chromatog. using Dowex-50 showed that the majority of flavor substances was adsorbed on a X-16 column and consisted of lower peptides and amino acids.
CA, V. 79, 1973: 114081p

BURKHOLDER, L.; BURKHOLDER, P.R.; et al.

Fish fermentation. (Lamont Geol. Observ., Columbia Univ., Palisades, N.Y.). Food Technol. (Chicago) 1968, 22(10), 1278-84 (Eng).

Microbial fermentation studies using pure cultures were undertaken to utilize an abundant and inexpensive fish (menhaden), to produce a food with pleasant aroma and flavor, to maintain or increase the protein content of the product without impairing its biol. value, and to reduce the fat content of the raw material, thereby insuring better shelf life of the product. Menhaden was fermented with a large no. of bacteria, yeasts, and molds from different sources. After organoleptic screening of the fermentation products, 7 yeasts and 1 mold were selected for further study. Chem. analyses of the fermentation products indicated that 3 yeasts and one mold could utilize menhaden triglycerides. These microorganisms were adapted to increasing concns. of menhaden oil in their growth medium. After this adaptation, 2 microorganisms reduced the fat content of young menhaden by 30-50%, and increased its protein content by up to 20%. At the same time, the fish odor of the starting material was changed to the flavors and aromas of certain well known and accepted foods. The fungus Geotrichum species and the yeast Candida lipolytica, are 2

promising microorganisms which may eventually be used for pure culture fermentation of fishery material to produce acceptable human foods. Penicillium mold may eventually be used if appropriate fermentation conditions can be worked out.
CA, V. 70, 1969: 10463n

CHOI, H.Y.; LEE, L.H.; et al.
Fermentation of fish protein. 1. Model design of fermentor. (Pusan Fish. Coll., Pusan, S. Korea). Pusan Susan Taehak Yon'gu Pogo, Chayon Kwahak 1971, 11(1), 45-56 (Korean).

Various factors for designing a model fermentor for the fish protein were given with respect to pH, temp. agitation, and factors required for optimum conditions for enzymic hydrolysis of fish protein.
CA, V. 77, 1972: 32669f

HAE, C.Y.; HAE, W.L.
Studies on the Jutt-kals, the Korean fermented fish products (4). J. Kor. Res. Inst. Better Living 1974, 13, 159-167. (Article in Korean)

The Korean fermented fish pickles, called Jutt-Kal, must be one of the most important and popular menus in Korea. The nitrosamine, carcinogenic agent; is chiefly distributed in fish and meat, and it is formed when both the secondary amine and the nitrite are present. The samples, in ten kinds of Jutt-kal, used here were chosen from the market in Seoul. The results were as follows:

1. The content of the secondary amine in Crassostrea gigas, Turbo cornutus, and Tapes philippinarum was less than of others.
2. The highest value of the secondary amine was 34.8 ppm in Acetes japonicus kishinouye, and the lowest one was 0.38 ppm in Crassostrea gigas.
3. The highest value of the nitrite was 0.740 ppm in Todarodes pacificus, and the lowest one was 0.116 ppm in Harengula zunasi bleeker.
4. The content of both the secondary amine and the nitrite was great in Todarodes Pacificus and was small in Turbo cornutus.

Korean Sci. Abstr., V. 7 (2) 1975: 263

HO, Y.C.; KANG, H.L.; et al
Studies on the fermentation of fish protein (I). A model design of fermentor. Bull. Pusan Fish. Coll. 1971, 11 (1), 45-56.

In Korea, fermented fish has been playing an important role as a preserved and flavor rich food. It is said that the digestion of fish protein is due to both action of intrinsic (autolytic enzymes) and bacterial enzymes in fish. The mass production of fermented fish has been impeded since traditional method of fermentation requires a long duration for a complete digestion. A high concentration of salt and unsanitary condition are also considered disadvantages of the old method. To improve the quality of the product and to develop mechanized process of fermentation, fermentors which have such control device as temperature, pH and agitation control system have been urgently needed. In this study, a model design of a fermentor is studied. The calculation was

based on the optimum conditions for enzymatic hydrolysis of fish protein which involve temperature, pH, viscosity and other factors.
Korean Sci. Abstr., V. 4 (2) 1972: 218

OHNO, E.; ASANO, M.
Special foods in Akita Prefecture. II. Factors affecting the quick ripening of Shottsuru (fish sauce). (Akita Univ., Akita, Japan). Akita Daigaku Kyoikugakubu Kenkyu Kiyo, Shizen Kagaku 1969, (19), 85-99 (Japan).

The factors stimulating digestion of Shottsuru (S), protease, optimal salt concns., and temp. in digestion, were studied. Protease from Streptomyces, esp., pronase (P) was a suitable enzyme for rapid digestion of S. P hydrolized the fish proteins, and by organoleptic test the product had good taste. Optimal salt concns. were found to be 21-24 wt.%, and the best, 24 wt.%. Only a small difference was obsd. in digestion at 30-50° for 10 days.
CA, V. 74, 1971: 139664r

TAKEI, S.
Fermentation of autolyzed fish or fish entrails. Japan. 9371('57), Nov. 7.

Autolyzed cuttlefish entrails 100 and molasses 5-7 parts are mixed, sterilized, and fermented for 24-72 hrs. at 42-50° with Lactobacillus delbruckii to sep. the mixt. into a top oil layer, a middle clear digested soln., and protein sediment.
CA, V. 52, 1958: 14076f

VARDHANABHUTI, S.; CHOUVALIT, J.; et al.
Effect of salt concentration and size of fish on course of fermentation and product quality of "nampla". Bangkok, ASRCT, 1970. 21 pp.

Cooperative Research Programme no. 31. Research Project no. 31/4: Acceleration of "nampla" fermentation by a biological quick process, report no. 2.
Food and Nut. in Thai. Med. and Tech. Asp. 1950-1970: 331

WITAS, T.
Fermented foods of marine origin. (Szczecin, Pol.). Przem. Spozyw. 1974, 28(2), 59-62 (Pol).

A review with 17 refs.
CA, V. 82, 1975: 84522a

YUN, H.C.
Studies on the Jutt-Kals, the Korean Fermented Fish Products (I) Trace Elements Contents of Jutt-Kals. J. Kor. Res. Inst. Better Living (Ewha Womans Univ.). 1969, 2, 103-9. Fig. 2 Tab. 5 Ref 16.

The Trace elements contents of Jutt-Kals, the Korean fermented fish products are studied in this paper. The chelate method is discussed for the determinations of Calcium and Magnesium. The o-phenanthroline method using UD-Spectrophotometer is discussed for the determination of Iron: And the polarographic method is discussed for the determi-

nations of Nickel, Zinc, and Copper. And applying the analytical methods discussed in the above, Fe, Ca, Mg, Ni, Cu and Zn contents of Jutt-Kals, are determined.
Korean Sci. Abstr., V. 1, 1969: 358

YUN, H.C.; LEE, H.W.
Studies on the Jutt-kals, the Korean Fermented Fish Products (4)
J. Kor. Res. Inst. Better Living 1974, 13, 159-167, 6 Fig. 3 Tab.
19 Ref. (Article in Korean)

The Korean fermented fish pickles, called Jutt-Kal, must be one of the most important and popular menus in Korea. The nitrosoamine, carcinogenic agent; is chiefly distributed in fish and meat, and it is formed when both the secondary amine and the nitrite ane present. The samples, in ten kinds of Jutt-kal, used here were chosen fiem the market in Seoul.
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4. The content of both the secondary amine and the nitrite was great in Todarodes Pacificus and was small in Turbo cornutus.

Korean Sci. Abstr., V. 7, 1975: 263

d. Nutritive Values and Its Component

AMANO, K.
The influence of fermentation on the nutritive value of fish with special reference to fermented fish products of Southeast Asia.
Fish in Nutrition, London, 1962: 180-197

Fermented fish and sauces are eaten in the protein-deficient Far East as condiments to relieve the monotonous rice diet. Individual daily consumption is not great, but use is virtually universal, and nutritional return is significant. The author examines how various fermentation processes change nutritive value. Products manufactured under about 60 names are grouped for examination according to their principal fermenting agent. Two groups of traditional products are discussed as well as non-traditional products manufactured by chemical hydrolysis, acid ensilage, and a new "quick" method. The author found nitrogen loss during fermentation of traditional products averaged about 30 per cent. Amino acid retention seemed fairly good. Fermented fish oil had little nutritional value, due to developing rancidity. Nutritional significance of B vitamins was judged minor. Three proposals to hasten fermentation are discussed. The author

finds no reported cases of serious poisoning from product consumption. He finds reasonable assurance of nutritional value in each product and establishment of quality control.
Author

ANONYMOUS
The relation of vitamin B12 in fish sauce and fermented fish to deficiency anemias in Thailand. in Med. J. (Thailand), 1957, Sept., 6, 467-69.

From Chulalongkorn Univ. Library Bibl. of material about Thailand ...
Food and Nut. in Thai. Med. and Tech. Asp. 1950-1970: 148

BERSAMIN, S.V.; NAPUGAN, R.S.J.
Preliminary studies on the comparative chemical composition of the different commercial brands of "patis" in the Philippines. Indo. Pacific Fisheries Council Proceedings, 9th. Session, 6-23 Jan 1961: 105-109

Various commercial brands of patis (fermented fish sauce) were analyzed comparatively, for their moisture, total solids, total nitrogen and sodium chloride contents. From the standpoint of nutrition, those with higher total nitrogen contents are considered the better grades. The total solids range from 28.56 percent to 37.81 percent and sodium chloride from 22.26 percent to 26.44 percent. Samples with high total solids have better keeping quality because of low moisture content. Although almost all the brand fall within the range requirement of total nitrogen, sodium chloride and total solids set by the Philippine Standard Association, yet, as revealed by the analysis these standards and requirements are met without technological planning and no effort is being made by the manufacturers to produce uniform standard grades of patis.
Author

DOUGAN, J.; HOWARD, G.E.
Flavoring constitutents of fermented fish sauces. (Trop. Prod.

Inst., London, Engl.). J. Sci. Food Agric. 1975, 26(7), 887-94 (Eng).

Gas chromatog. showed that lower fatty acids were responsible for the cheesy odor of fermented fish sauce and NH_3 (7664-41-7) and amines for the ammoniacal odor. The much more complicated meaty aroma was not analyzed but could have been due to atm. oxidn. of precursors still present in the mature sauces. Fat oxidn. is the suggested source of fatty acids.
CA, V. 84, 1976: 29321a

HAE, C.Y.
Studies on the Jutt-Kals, the Korean fermented fish products (3). Nitrogen compounds of Jutt-Kals. J. Kor. Res. Inst. Better Living 1973, 11, 59-67. (Article in Korean)

The nitrogen compounds of Jutt-Kals, the Korean fermented fish products are studied in this paper. The Kjeldahl method is discussed for determination of total nitrogen and volatile nitrogen, Van Slyke method is discussed for determination of free amino acid. The results are shown in table 4 in the original paper. For studies of sanitary science of Jutt-Kals, diazo reaction using DU-spectrophotometer is discussed for the determination of histamine. And in addition to histamine content, pH, acidity, sodium chloride contents and ash were determined.
Korean Sc. Abstr., V. 6 (2) 1974: 289

IKEUCHI, T.; SHIMIZU, W.
Protein-oil-water system in kamaboko. II. Change of jelly strength by adding oil in kamaboko made from different species of fish. (Univ. Kyoto). Nippon Suisan Gakkaishi 1959-1960, 25, 141-3; cf. CA 50,8934a.

Addn. of soybean oil, below 20%, to fish-meat paste did not influence the jelly strength (I) of kamaboko (II) (steamed fish-meat cake) but over 20% greatly decreased I. It may be that below 20% the added oil is held in the net-work structure of the heated fish-meat protein in a stable oil-H_2O emulsion; beyond this limit, the emulsion is broken. I fall due to excess oil differed among fish species whose meat is used as material for II manuf.

III. Effect of freshness of fish on jelly strength of kamaboko containing oil. Ibid. 144-6.

The meat paste from fresh fish did not liberate oil on heating even when 50% of soybean oil was added, but the paste from fish of low freshness could not hold 15%. II made from fresh fish maintained I even when considerable oil was added. With that from not so fresh meat added oil decreased I. The results were discussed in regard to colloid and degeneration properties of fish-meat proteins.
CA, V. 54, 1960: 16686f

IKEUCHI, T.; SHIMIZU, W.
The protein-oil-water system in kamaboko. IV. Effect of water on the jelly strength of kamaboko containing oil. (Univ. Kyoto). Nippon Suisan Gakkaishi 1959, 25, 316-18; cf. CA 54, 16686f

Adding H_2O during kamaboko (fish meat paste) manuf. did not influence the jelly strength when the amt. was not too great. The oil-H_2O emulsion in I was more stable in the presence of larger amts. H_2O diminishes the effect of oil on decreasing the jelly strength of I.
CA, V. 54, 1960: 17741e

ISEKI, S.; WATANABE, T.; et al.
Liquified fish protein. V. Yield of protein in digestion of washed meat paste and whole fish. (Tokai Reg. Fish. Res. Lab., Tokyo, Japan). Tokaiku Suisan Kenkyusho Kenkyu Hokoku 1973, (73), 85-101 (Japan). Cf. CA 74: 98377d.

Washed Alaska pollack meat was mixed with the same vol. of water and was hydrolyzed at 55° for 4 hr with one of 3 com. proteinases:

pronase-P from Streptomyces griseus, BNP from Bacillus polymyxa, and OFP-10 from Bacillus species. About 20% of the pollack proteins was solubilized in autolysis. As liquified protein, 95% of the total N in the pollack meat was recovered by 0.3% pronase-P treatment, while only 65 and 45% of the N were recovered as liquified protein by treatments with 0.3% of BNP and OFP-10, resp. The yields were not much increased by increasing the concn. of enzyme from 0.3 to 0.5%. The addn. of Ca^{2+} used as a stabilizer of enzymes was not effective. NaCl added to pollack meat decreased the yield of product at >2.5% of the paste.
CA, V. 80, 1974: 46605f

KAWASHIMA, T.; ARAI, K.; et al.
Muscular proteins of fish. X. Amount of actomyosin in frozen surimi from Alaska pollack. (Wakkanai Fish. Exp. Stn., Wakkanai, Japan). Nippon Suisan Gakkaishi 1973, 39(5), 525-32 (Japan).

Stability and soly. of actomyosin from frozen surimi (fish paste) were studied. In an unsalted sample 5% sucrose or sorbitol exerted a similar protective effect on the denaturation of actomyosin. With the salted surimi, sorbitol worked better than sucrose. The amt. of extractable protein in both samples was unchanged during 4 months of storage at-20%.
CA, V. 79, 1973: 41068c

KRISHNASWAMY, M.A.; KADKOL, S.B.; et al.
Nutritional evaluation of an ensiled product from fish.(Central Food Technological Research Institute, Mysore, India). Canadian Journal of Biochemistry 1965, 43, 1879-1883.

Ensiled fish was prepared from a local variety of freshwater fish (Barbus carnaticus) by fermentation with a pure culture of Streptococcus lactis, commercial lactose being used as a source of fermentable carbohydrate. The fermented material (pH 4.7) was roller dried. The finished product was cream colored and had a somewhat aromatic odor. It had a protein content of about 72%. Total lysine, available lysine, methionine, cystine, and tryptophan of the ensiled fish (expressed as g/16 g N) were 10.1, 8.1, 3.6, 1.1, and 1.2%, respectively. Hygienically, the product, being free from coliforms, enterococci, Salmonella, coagulasepositive staphylococci, and pathogenic anaerobes, was satisfactory. The biological value of the product as determined by protein efficiency ratio (3.3), net protein utilization (82.3%), and net protein ratio (4.2) was not significantly different from that of skim milk powder, which has a protein efficiency ratio of 3.2, net protein utilization of 82.8%, and net protein ratio of 4.9.
Author.

KRISHNASWAMY, M.A.; PATEL, J.D.
The effect of certain preservatives on the shelf-life of fish sausage. (Central Food Tech. Res. Ins., Mysore). J. of Food Sci. and Tech. 1972, 9 (1), 10-12.

Shelf-life studies conducted at room temperature (RT) and at 37°C of fish sausage manufactured on a semi-pilot plant-scale, indicated

that furyl-furamide in combination with potassium sorbate conferred longest shelf-life to fish sausage, followed by furyl-furamide used alone. Potassium sorbate alone or in combination with sodium benzoate gave limited shelf-life to the product. Shelf-life of fish sausage preserved at RT with furyl-furamide in combination with potassium sorbate was 50 days and that with furyl-furamide alone was 30 days. At 37°C, the shelf-life of fish sausage with the above combination of preservatives was comparatively shorter (20-25 days).
Author.

MIWA, K.; IIDA, H.
Ethyl alcohol determination in shiokara by the microdiffusion method. (Tokai Reg. Fish. Res. Lab., Tokyo, Japan). Nippon Suisan Gakkaishi 1973, 39(11), 1189-94 (Japan).

EtOH in shiokara (a fermented fish product) was detd. by the microdiffusion method of E.J. Conway (1952), in which EtOH was sepd. from the product by volatilization, oxidized to MeCHO with $K_2Cr_2O_7$, and reacted with KI to form I_2. The procedure was modified by adding thiosemicarbazide-HCl, which prevented interference by HCHO, MeCHO, and other carbonyls present in the original sample.
CA, V. 80, 1974: 69252c

MOEN, A.
The content of free fat acids in herring meal. Tids Norske Landbruk 1933, 40, 153-7.

Analyses of a no. of samples of Norwegian herring meal, showing that the detns. usually carried out to est. the quality of the meal appearance, odor, microscopic examn., ammonia, fat and water in some cases will prove insufficient, and that a detn. of free fat acids in such cases may furnish an addnl. basis of judgment. The samples of fresh meal showing ammonia contents from 0.11 to 0.15% contain 3.7-6.4% of free fat acids, while other samples, althrough the ammonia content is about the same, contain 10-40% free fat acids, indicating inferior quality in spite of the ammonia value being within the limit considered satisfactory. The ammonia in these cases seems to have been driven off by sharp drying, as the water content of the samples is also relatively low.
CA, V. 30, 1936: 3669^8

MOORJANI, M.N.; BALAKRISHNAN NAIR, R.; et al.
Fish protein enriched corn starch. (Central Food Technological Research Institute, Mysore). Res. and Ind. 1962, 7 (9), 307-308.

Fish-protein enriched corn starch containing 40 per cent protein has been prepared by blending 3 parts of muscle portion from lean fish with 1 part of corn starch. The product is steam-sterilized, dried and finely ground to 100-mesh or made into thin attractive flakes by drum-drying.
Author.

NAVARRO, O.B.
Availability of calcium in bagoong and dilis. Bulletin of the Fisheries Society of the Philippines, 1950, v. 1, p. 38-46.

Four groups of 8 albino rats each were fed experimental diets containing calcium in the form of $CaCO_3$, milk powder, "bagoong" and "dilis". A fifth group which served as control had a low calcium diet derived from casein. The amount of food eaten by each animal was recorded and the weights of the rats were taken at the end of each week. After 4 weeks feeding, representative animals from each group were weighed and killed for calcium analysis of their carcass. The average percentage calcium retention obtained for the milk powder, $CaCO_3$, "bagoong" and "dilis" are 96.8, 80.2, 60.8 and 87.2% respectively. The retention of calcium from "dilis" is approximately 90% that of milk powder and from "bagoong" it was only 62%.
Philp. Abst. Nut. and Related Topics 1961: 209.

PREISS, W.

Determination of hydroquinone with particular reference to its determination in salt herrings, Z. Untersuch. Lebensm. 1934, 67, 144-60.

It is shown be expt. that in the iodometric detn. of hydroquinone (in small amts.) the use of $KHCO_3$ for neutralization leads to incorrect results. If CO_2 is used to full satn. before introducing the $KHCO_3$, the method is usable. The use of either Na_2HPO_4 or AcONa is preferable. Statements in the literature to the contrary, quinone can be distd. with water vapor without decompn. if one maintains a suitable pH. On the basis of this fact, a distn. method was worked out which seps. the hydroquinone and quinone in a simple fashion from other substances and they are then detd. The qual. methods for detecting hydroquinone and quinone are discussed and a new sensitive method is given for identifying them in salt-hydroquinone mixts. Convenient methods are given for the identification of hydroquinone and quinone in herring brine and in salt herring, as well as for their detn. in salt mixts. and of hydroquinone in herring brine and in salt herring. Hydroquinone undergoes changes through the action of other substance in herrings, whereby the hydroquinone content decreases on letting the herrings stand, Expts. indicate that this reduction in the amt. of hydroquinone is due to reactions of quinone produced by the oxidation of the hydroquinone. Twenty-two references.
CA, V. 28, 1934: 3030^6

SAISITHI, P.

Studies on the origins and development of the typical flavor and aroma of the Thai fish sauce. Univ. of Washington, Doctoral dissertation, 1967. 184 pp.

An investigation of the microbiology and chemistry of Thai fish sauce in relation to the development of colour, flavours and aroma. Discusses the causes and processes of protein degradation and the disappearance of some amino acids in the fermentation process due to the action of bacteria and enzymes.
Food and Nut. in Thai. Med. and Tech. Asp. 1950-1970: 307.

SIANTURI, I.

Changes of water and nitrogen content of "trasi" during commercial preparation and storage. Maj. Inst. Teknol. Bnd. 1961, 1 (3), 2-10.

A study was made of the water and nitrogen (N) content of different types of trasi during its commercial preparation and following storage. The types analyzed were trasi ikan (I), a paste made from small fish, trasi udang gonjean (G) and trasi udang kundulan (K). The latter two types are pastes prepared from shrimp. G is the product prepared in the dry season and K in the wet season. The change in water and N of trasi during its preparation was observed in Pangarengan anl in Indramayu. It was found that the total water loss of the fresh material was for all three types about 34%. A relatively large apparent N loss occured during the preparation of the 1st production stage. It was supposed that this was the result of the addition of flavoring substances which affects the % N but not the N content. The total N loss during the preparation is the largest for K when compared with G and I. During storage over 6 months, using freshly prepared trasi Indramayu (type G and K) and purchased trasi (- exact age, type and production place unknown) it was found that the water content decreases with 6-10%. The N content decreases during this period with 0.65-0.95%. Type G shows a smaller N loss than K. Of the purchased samples the least expensive product shows the largest N decrease. Proposals are made :
1. To decrease the labor and time of commercial trasi preparation.
2. To increase the keeping quality and standardize the commercial product. This was believed to be of value, because of the extensive use of trasi in the Indonesia diet.
Author

STOLDT, W.
Composition and testing of fish sausages. (Nahrungsmittelunters.-Amt., Kiel, Ger.). Deut. Lebensm.-Rundschau 1949, 45, 5-6; Chem. Zentr. 1949, 766.

Analyses of a large no. of fish sausages are reported. Water, protein, fat, ash, carbohydrate, and caloric value were detd. A min. protein content of 14% and an ash-free dry substance content of 17% are necessary to insure a nutritive value of 70 cal./100 g.
CA, V. 46, 1952: 7247d

SUGII, K.; KINUMAKI, T.
Liquefied fish protein. VI. Comparison of composition in different products by the use of commercial proteolytic enzymes. (Tokai Reg. Fish. Res. Lab., Tokyo, Japan). Tokaiku Suisan Kenkyusho Kenkyu Hokoku 1973, (73), 103-12 (japan).

Washed Alaska pollack meat paste was mixed with the same wt. of water and incubated with or without 0.3% of proteolytic enzymes. Polypeptides were mainly produced during autolysis at 55° for 4 hr. and with addn. of the enzymes, the mol. wt. of the products was lowered.
CA, V. 80, 1974: 46604e

TAKAGI, I.
Rheological properties and structure of kamaboko. XII. Dependence of the stress relaxation moduli on myofibrillar protein concentration in kamaboko. (Ayabe Higher Sch., Ayabe, Japan). Nippon Suisan Gakkaishi 1973, 39(7), 777-81 (Eng).

The dependence of the reduced tensile stress relaxation moduli on the concn. of myofibrillar proteins in kamaboko was studied. Although kamaboko is an irreversible hydrogel formed by heat denaturation and contains some proteins other than the myofibrillar proteins, the dependence of its equil. and instantaneous moduli on the concn. of myofibrillar proteins could be expressed by equations. By comparing the relaxation moduli for kamaboko prepd. from fish muscle (croaker, Argyrosomus argentatus, and jack mackerel, Trachurus japonicus) with sol. protein extensively removed and those for kamaboko prepd. from fish muscle with sol. protein retained, it was found that myofibrillar proteins were distinctive components of the stable cross-linked network in kamaboko. When brayed fish muscle was heated it changed into a rubber-like kamaboko in which cross-linkings and entanglements were formed. However, dense entanglements between network segments which were loosened in the earlier time scale of stress relaxation were obstructed when water-sol. protein coexisted with the network-forming proteins.
CA, V. 79, 1973: 103777u

TIDS, A.M.
Free fatty acid content of herring-meal fat. Norske Landbruk. 1933, 40, 153-7.

Herring meal of low H_2O content keeps better than that of high. Quality can sometimes be judged on NH_3 content, but the NH_3 content of well-dried meal may be low. In such cases the content of free fatty acids, normally about 5% of the fat, gives a good indication of quality, being as high as 40% in samples where much decompn. has occured.
CA, V. 28, 1934: 2928^9

VELANKAR, N.K.
Chemical properties of fish sauce from Thailand. (Central Marine Fisheries Research Sta., Mandapam). J. Sci. Ind. Research (India) 1952, 11B, 310-11.

Chem. analysis of the fish sauce, produced by putting whole ungutted fish mixed with one-quarter its wt. of NaCl into wooden vats under pressure for several months, showed the presence of peptones, amino acids, and NH_3 which were produced by the autolysis of the albuminoids. The high formol N values indicated extensive proteolysis, the sauce being essentially a protein hydrolyzate. The high concn. of NaCl in the sauce inhibited vegetative multiplication, but the spores remain viable for long periods in a dormant condition. Fifteen g. of total N was obtained per kg. of fish from one of the hydrolyzates.
CA, V. 47, 1953: 4007c

VIALARD-GOUDOU, A.; LAMBIN, S.; et al.
The vitamin B_{12} activity of a Vietnamese fish sauce "Nuocmam."
Compt. rend. 1954, 238, 2193-5

The vitamin B_{12} activity of 12 samples of a Vietnamese condiment derived from various fish and called "Nuoc-mam" (I) is reported to be equiv. to 25 to 200 γ of vitamin B_{12}/l. There was no relation

between the vitamin B_{12} activity and the total or org. N content of I. The assays were performed by the method of Burkholder (C.A. 46, 2625c) with Escherichia coli and confirmed by the method of Lambin, et al. (C.A. 47, 8815e) utilizing Lactobacillus leichmannii. Assays with E. coli made before and after hydrolysis of I which destroys vitamin B_{12} but not methionine indicated that this amino acid did not affect the assays. Vitamin B_{12} assays with L.leichmannii, which is not affected by methionine, confirmed this. It was observed that methionine contents of less than 25,000 times the vitamin B_{12} content of I did not affect assays with E. coli (C.A. 44, 9512c). The final salt concn. in the assay media was less than 01 mg./cc., a concn. which does not influence the assay with E. coli. The authors verified that there are no substances in I which inhibit the growth of E. coli in the presence of vitamin B_{12}.
CA, V. 49, 1955: 1986d

e. Prevention of Spoiled Quality

HARDJOHUTOMO, H.
Improvement of keeping quality of pindang. Bandung, Indo. Pacific Fisheries Council Proc. 7th Session 13-27 May 1957, 107-9.

According to old preservation methods "Pindang" (preserved fish in earthen pots) keeps only for several days. Due to this and because of lack transportation, distribution to far away places has become a real problem. To bridge the distance from the coast to the mountain regions, efforts have been made to improve the keeping quality of the product by using better pots. The porous clay traditionally used were first sterilized by soaking for 2 days in a 1% chlorine solution. The rubber sealing rings were treated with 2% potassium meta-bisulfite solution. After filling and processing, the sealed pots were treated externally with two coats of a 4:1 paraffin-resin mixture at 70° C to seal the pores. With improved processing methods, the "pindang" maintains its quality for 9 months.
Author

IIMORI, M.; TOMIYAMA, S.
Glycerol for preservation of fish paste. (Lion Fat and Oil Co., Ltd.) Japan. Kokai 73 44,457 (Cl. 34 F6, 34 F04), 26 Jun 1973, Appl. 71 79, 622, 09 Oct 1971; 3 pp.

Paste prepd. from fish was preserved by incorporating 3-20% by wt. of glycerol into the paste. Effective preservation of paste was not possible with ≤3% glycerol. The greater concns. (≥20%), on the other hand, were detrimental to the taste of the meat. Thus, the meat from sea bream, salt, starch, Na glutamate, water, and glycerol (81,3, 5, 1, 5, and 5 parts by wt., resp.) were mixed, kept at room temp. for 2 hr to expose the product to bacteria, and then incubated at 20° for 48 hr. The no. of bacteria detd. after incubation was only 4.4×10^4/g paste as compared to 4.2×10^7/g paste contg. no glycerol.
CA, V. 79, 1973: 90663b

OBATA, S.; OHHASHI, S.; et al.

Preservatives for weiner sausage and fish paste. (Sanei Chemical Industries, Ltd.) Japan. Kokai 73 44,417 (Cl. 30 F352, 34 A1, 30 F911), 26 Jun 1973, Appl. 71 81,108, 13 Oct 1971; 4 pp.

Foods (fish paste and sausage) were preserved with a combination of sorbic acids and one or more substances selected from org. and inorg. acids or metallic ions. Sorbic acids were stabilized and the effecttiveness of the acids was maintained for a long time. Thus, propylene glycol caproic acid ester, sorbitan capric acid ester, and glycerol stearate (5, 10, and 15 parts, resp.) were liquefied by heating, and to this mixt. was added sorbic acid, citric acid, Na polyphosphate, and desiccated alum (20, 10, 35, and 5 parts, resp.). Wiener sausages contg. this product (1%) and a conventional sorbic preservative (1%) were preserved for as long as 16 days, but controls without preservatives were spoiled within 3 days.
CA, V. 79, 1973: 90655a

OBATA, S.; OHHASHI, S.; et al.

Preservatives for fish paste. (Sanei Chemical Industries, Ltd.) Japan. Kokai 73 44,418 (Cl. 30 F352, 34 Al. 30 F91), 26 Jun 1973, Appl. 71 81,109, 13 Oct 1971; 4 pp.

Food preservatives were prepd. with sorbic acids, org. and inorg. acids, metallic ions, and surface active agents. They prevented discoloration, hardening, and sepn. of oil from food material. Thus, a mixt. of sorbitan capric acid ester and propylene glycol stearate was liquefied by heating. To this mixt. was added sorbic acid, citric acid, and Na polyphosphate. A fish-paste contg. 1.0% of this product was well preserved for 16 days at 34°, while the control without the preservative was spoiled within 3 days.
CA, V. 79, 1973: 90654z

TABATA, Y.

Characteristics of temperature-dependent viscoelastic changes in brayed fish meat and the effects of additions of yeast proteins, etc., to the brayed fish meat. (Fac. Fish, Nagasaki Univ., Nagasaki, Japan). Nagasaki Daigaku Suisangakubu Kenkyu Hokoku 1974, 37, 45-53 (Japan).

In contrast to kamaboko of which viscoelasticity changed inversely with temp., viscoelasticities of brayed fish meat showed little change at 20-50°, but decreased at 50-60° and increased up to near 100°. Protein from HOAc-assimilating yeast and activated gluten were less inhibitory to setting than protein from hydrocarbon-assimilating yeast.
CA, V. 82, 1975: 96653g

TOMIYAMA, T.; YONE, Y. et al.

The method for testing the spoilage of food. VIII. A new turbidimetric method for determination of freshness of cooked fish paste. (Kyushu Univ., Fukuoka). Bull. Japan. Soc. Sci. Fisheries 1955, 21, 954-7; cf. C.A. 49, 4901f.

Conditions of washing the surface of cooked fish paste, kamaboko, and dilg. the washings for turbidimetric detn. of the freshness were

studied. The turbidity of the washings under appropriate conditions paralleled the catalase activity, thus indicating that it can be a measure for the freshness of the product.
CA, V. 50, 1956: 13322f

TOMIYAMA, T.; YONE, Y.; et al.
Method of preserving freshness of "Kamaboko" a dried fish paste. II. Effectiveness of ethyl gallate, gallic acid, cover, and infrared or ultraviolet rays, and both types of radiation. Sci. Bull. Fac. Agr., Kyushu Univ. 1957, 16, 137-44.

The normal 2-day stability of fish paste is extended to 3 by cellophane, to 4 by infrared, and to 5 by daily ultraviolet irradiation. Combining cellophane cover, ultraviolet, and infrared treatment with 0.002-0.4% ethyl gallate (I) increased the stability to 7 days. I plus gallic acid plus cellophane and ultraviolet treatment had no effect.

III. Effect of chemical and physical treatment on the stability of "Kamaboko". Ibid. 145-56.

Studies at 26° showed that treatment with dehydroacetic acid (I) or its Na salt increased stability for 6 and 4 days, resp. Butyl p-hydroxybenzoate and o-hydroxybenzamide were less effective. Polyvinyl sheaths, alone or combined with chem. treatment, decreased stability. Poly(vinyl acetate) sheaths allow passage of ultraviolet light and are suitable. A combination of the latter and addn. of 0.1% I, together with daily ultraviolet irradiation, lengthens the stability to 10 days. From C.Z. 1958, 4648
CA, V. 54, 1960: 12415i

f. Storage

KAWASHIMA, T.; OOHORI, T.
Bleaching of fish meat products with water. IV. Relation between the meat temperature and actomyosine content in the manufacturing of frozen fish meat paste. (Wakkanai Fish. Exp. Stn., Wakkanai, Japan). Hokusuishi Geppo 1974, 31(4), 13-22 (Japan). Cf. CA 74:12813c.

Sepd. Alaska pollack (Theragra chalcogramma) meat was bleached with water, pressed, and minced with the addn. of sugar and polyphosphate to make a meat paste. During processing, the actomyosin content was decreased with an increase in meat temp. from 5 to 25°. In June-Sept, 20-35% of the actomyosin in the meat (meat at 15-25°) was denatured (estd. from inactivation of Ca^{++}-ATPase) in the process; however, in Nov.-Mar., the extent of denaturation (meat at 1-10°) in the same process was $\leq 10\%$.
CA, V. 81, 1974: 103378f

OKADA, M.
Frozen storage of kamaboko. (Tokaiku Fisheries Inst., Tokyo). Reito 1966, 41(3), 211-6 (Japan).

Raw meat paste of Nibea argentata with addn. of 2.5% NaCl and 10% sugar was preheated at 45° or 60° in order to obtain an elastic or a brittle kamaboko before steaming at 80° was performed. Kamaboko thus prepd. was frozen at-40° and stored at -28° for 2-3 months. The jelly strength, softness, water-holding power, and elasticity were observed during storage. Rapid freezing was necessary and an elastic product was more favorable than a brittle one for frozen storage.
CA, V. 65, 1966: 1296e

SHIMIZU, H.; SHIMOMURA, T.; et al.
Mashed frozen fish meat. (Ueno Pharmaceutical Applied Research Laboratory) Japan. 73 18,468 (Cl. A 23b), 06 Jun 1973, Appl. 68 20,004, 29 Mar 1968; 3 pp.

Addn. of fatty acid glycerides improved the quality of frozen fish paste (important raw material for kneaded food products such as sausage, kamaboko, etc.) during long term storage. Thus, fillets of cod were ground and soaked in H_2O at 7-8°, while changing the H_2O until the supernatant became clear; the H_2O content of the mashed meat was decreased to ~70% by centrifugation and 2.5% NaCl was added; after 15 min mixing, 1% glycerol monostearate and 5% sucrose were added and mixed for an addnl. 15 min; the product was stored at -30° for 6 months. Sausages were produced from the mashed frozen cod meat; they had very high quality as detd. by elasticity, sol. actomyosin content, and taste.
CA, V. 80, 1974: 36033d

TANOMOTO, K.
Frozen fish paste without addition of table salt. (Hokkaido Central Fisheries Inst., Hakodate, Japan). Reito 1966, 41(3), 188-201 (Japan).

The effectiveness of sugars and polyalcs. on prevention of denaturation of pollack meat without addn. of table salt during frozen storage was studied. Addn. of 4-10% sugars with 0.5% Na tripolyphosphate or Na pyrophosphate to pollack meat prevented denaturation during storage at -20° for 30 days. Of the sugars tested, galactose, glucose, sucrose and sorbitol were more effective than fructose, lactose, and maltose. Ethylene glycol, 20% by wt., was added to pollack meat and the mixt. stored at -3° and -9°, resp. After 16 days, about 50% of the salt-sol. protein was decreased in the control meat, whereas 90-95% of salt-sol. protein remained in the treated meat at both storage temps. Glycerol, ethylene glycol, and polyethylene glycol were less effective than sugars in retarding the denaturation of pollack meat during storage.
CA, V. 65, 1966: 1296c

YAMAMOTO, T.
Freezing of kamaboko by liquid nitrogen. (Natl. Kamaboko Co-op. Assoc., Tokyo). Reito 1966, 41(3), 217-22 (Japan).

Kamaboko, steamed fish-meat jelly, frozen in liquid N for 4-5 min. was compared with that frozen in ice-cream locker at -20° for 50 min. after storage at -20° for 3 months. After the storage period, the surface of the former sample did not dry on account of grazing with micro granules of ice and the elasticity and other phys. properties were better than in the latter sample.
CA, V. 65, 1966: 1296f

VI VINEGAR

a. Method of Preparation

ADRIANO, F.T. ~~and~~ YLIZARDE, H.L.
Preparation of vinegar from Philippine fruits and other saccharine materials. Phil. J. Agriculture, 1933, 4:215. Also in U.P. Nat. Appl'd. Sc. Bull., 1933, 3: 443.

Methods of preparing vinegar from fully ripe, sound fruits and juices, such as bananas, nipa sap and coconut water were described. In general, the banana vinegar gives percentages of acidity higher than the legal standard of 4%. The aroma of the original substance is retained. Nipa sap, heated to boiling, then cooled and subsequently fermented, produces a higher percent of acetic acid in the resulting vinegar.
Nutr. Related Topics, 1953: 7

AMANO, T.; TAKEUCHI, T.; et al.
Vinegar. VI. Changes in the composition due to the difference of fermentation methods. (Food Res. Inst., Japan). Aichi-Ken Shokuhin Kogyo Shikensho Nempo 1972, 13, 101-7 (Japan).

Compns. of nonvolatile org. acids, amino acids and aromas were compared in vinegar produced by aerobic fermn. and by static fermn. in media contg. exts. of sake lees. The EtOAc [141-78-6] content was higher in the vinegar from static fermn., whereas no differences were obsd. in other aroma compns. No change was detected in compns. of nonvolatile org. acids, and amino acids throughout the entire period of expt. in both methods.
CA, V. 84, 1976: 29391y

ANONYMOUS
Standards for vinegar. Official Gazette, 1971, 67, (1) 38-39.

This Regulation defines various categories of vinegar and specifies, inter alia, that: vinegar must contain not more than 18 ppm of lead, 66 ppm of copper, and 1.5 ppm of arsenic; vinegar containing any artificial matter such as synthetic acetic acid or a cloudifying agent is deemed to be adulterated and its sale prohibited.
Author.

ASH, C.S.
Vinegar from alcoholic solutions. (Calif. Packing Corp.) U.S. 1,948,836, Feb.27.

For conversion by a plurality of intermittent fermenting steps, a porous bed of substantially insol. material such as pumice or wood shavings is inoculated with vinegar enzymes, a film of the alc. soln. is formed upon the surfaces of the bed and acetic fermentation is conducted on the surfaces, an excess of alc. soln. from storage being passed through the bed, drained off and recirculated. App. is described.
CA, V. 28, 1934: 2842^8

BARKER, T.A.E.

Vinegar from cane juice. Rept. Dept. Sci., Agri. Barbados 1930-31, 58-60; Sugar Abstracts (Facts About Sugar) 26,499.

BENON, M.

Manufacture of banana wine and vinegar. (Generale Alimentaire) Fr. 2,097,576 (Cl. C 12gj), 07 Apr 1972, Appl. 70 25,834, 10 Jul 1970; 6 pp.

This process described the making of wine from bananas and its conversion into vinegar. The new method overcame the problems of oxidn. and bacterial action which could block alc. fermentation. After treatment with a mixt. of enzymes like pectinases and pectases, the juice was extd. by pressing. Fermentation took place in an atm. of an inert gas. The process was economical due to the amt. of EtOH produced and the recovery of yeast.
CA, V. 77, 1972: 124784t

BUNKER, H.J.

Alcoholic beverages and vinegars. (Twickenham/Middlesex, Engl.). Qual. Contr. Food Ind. 1972, 3, 81-149 (Eng).

Edited by Herschdoerfer, S.M. Academic Press: London, Engl. A review. Beer, cider, perry, wines, potable spirits, rum, and vinegar processing and anal. are discussed. 247 refs.
CA, V. 77, 1972: 124691k

CHAKRAVARTI, S.N.; NAUTIYAL, B.R.; et al.

Criteria for deciding whether a mash is meant for illicit distillation or vinegar manufacture. J. Indian Chem. Soc., Ind. & News Ed. 1942, 4, 218-222.

During the ordinary process of sirka fermentation (indigenous method), the alc. strength usually goes up to much more than 2% of proof spirit and none of the methods proposed for distinguishing between mashes meant for illicit distn. and those meant for the manuf. or vinegar is conclusive and absolutely reliable. Illicit distillers can be controlled by licensing vinegar manuf. From the fermentation of 3 sets of 14 different gur solns. and 3 samples of cane juice, without added ferment, with sirka only and with yeast, it was found that: (1) max. alc.strength was usually attained more quickly when yeast was added; (2) max acidity was usually reached in approx. 3 months; (3) the ratio of alc. to acid did not distinguish mash intended for the manuf. of illicit spirit from that meant for the prepn. of vinegar; (4) in absence of added yeast appreciable quantities of alc. were formed only in gur solns. contg. more than 10% of gur; (5) exposure to direct sunlight gave the best yield of AcOH by the indigenous method of vinegar manuf.; (6) cane juice is more suitable starting material than gur soln. in the prepn. of vinegar by the indigenous method; (7) where no ferment was added more alc. was formed than where sirka ferment only was added; (8) results vary with the nature of gur and cane juice; (9) aldehydes and furfural were present only in minute traces; (10) higher alcs. and esters were present in only small amt.; and (11) oxidation values, I values and yeast and bacteria counts were of no use.
CA, V. 36, 1942: 3905^9

COPPIN, C.A.

Quick Vinegar production from sugar-cane products. Trop Agr. (Trinidad) 1932, 9, 140-144.

The advantages of using AcOH are pointed out for the inversion of sucrose in the manuf. of sirup - from sugar-cane juice. The optimum conditions for the preliminary alc. production from cane juice were 290 and pH 4.7. For rapid fermentation 100 gal. juice with Brix 15.0 require the addn. of 1 lb. $(NH_4)_2SO_4$, 1 oz. superphosphate, 2 oz. K_2SO_4, and 3 oz. H_2SO_4. Thirty hrs. after inoculation this soln. contain 6% alc. by vol. Details are given for the rapid conversion of this soln. to vinegar.
CA, V. 28, 1934: 2459^6

DAS, B.; SARIN, J.L.

Vinegar from dates. Ind. Eng. Chem. 1936, 28, 814.

The fleshy part of the date fruit, Phoenix sylvertris, is used. The fleshly part constitutes 60% of the wt. of the fruit and contains approx. 36% sugar. The fruit is cooked and the juice is removed by pressing. It is inverted with HCl. Yeast is added to the 17° Balling juice and nutrients consisting of phosphates of Mg, Ca and NH_4 are added. After 7 days the fermentation is completed and the fermented juice is subjected to acetone fermentation in an open vat by adding pure cultures of Mycoderma aceti and 10% unpasteurized mother vinegar. The mixt. is kept still and in the dark for 2 months. The finished vinegar has a sp. gr. 1.18 and contains 4.98% acetic acid, traces of C_2H_5OH 2.17 g. solids and 0.17 g. ash per 100 cc. The yield is 12-15 gals. standard vinegar per 100 lbs. fresh fruit. The vinegar may be clarified with 2% Hyflo and filtration under pressure. Pasteurization is employed to sterilize the vinegar.
CA, V. 30, 1936: 6126^7

EAPEN, K.C.; RAO, T.N.R.; et al.

Vinegar. II. Standardization of conditions for a laboratory acetator. (Cent. Food Technol. Res. Inst., Mysore, India). Indian Food Packer 1970, 24(6), 5-10 (Eng).

Various factors were studied to standardize conditions required for acetification in an acetator. Results showed an optimum air rate between 14.4 and 19.2 l./hr and an optimum air particle size of 1/60 inch. Preactivation of the culture shortened the period of acetification. Interruption of aeration was detrimental to the organism. Barley malt ext., palm neera molasses and jaggery were suitable as raw materials. Losses in alc. were considerable but might be reduced by temp. control.
CA, V. 75, 1971: 18693m

EGGEBRECHT, H.

Specific gravity of vinegar and its importance in the practice of vinegar fermentation. Deutsche Essigind. 1926, 30, 221-3.

A discussion a table for the estn. of AcOH in mixts. of pure AcOH and H_2O.
CA, V. 20, 1926: 2893

EGGEBRECHT, H.
Banana vinegar. Deut. Essigind. 1939, 43, 145-7.

While the ripe banana normally contains some 16-17% fermentable sugar, a fermentation of ists mash is attended with some difficulty chiefly because of its mash ist phys. characteristics. If mashed with a moderate amt. of H_2O, fermentation can be effected with a vigoruous yeast (without preliminary pasteurization) preferably at not above 22-30. The product was treated with a Seitz filter and the filtrate distd. for alc. The filtration can more properly be effected through filter cloths. After acetic fermentation of the resulting alc. liquid, a vinegar was obtained with an aroma very like fresh bananas.
CA, V. 33, 1939: 5980

ELMER, L.S.
Vinegar generator system for alcohol conversion. U.S. 2, 156,428, May 2.

Various structural and operative details.
CA, V. 33, 1939: 5988

GARRIDO MARQUEZ, J.
Methods for the assay of wine vinegar. Determination of the fundamental components. (La Semana Vitivinicola, Valencia, Spain). Sem. Vitivinic. 1972, 27(1.348), 2.191, 2.193, 2.195 (Span).

A method was given for the quant. anal. of wine vinegar, including the detn. of ash, total ext. and total, fixed, and volatile acidity.
CA, V. 77, 1972: 124701p

GRAWFORD, S.L.; WARD, J.M.
Constituents of commercial cider and apple product vinegar. Fruit Products J. 1933, 13, 48-51.
CA, V. 28, 1934: 2459^6

GREENSHIELDS, R.N.; JONES, D.D.
Vinegar. Brit. 1,293,018 (Cl. C 12j), 18 Oct 1972, Appl. 5973/70, 07 Feb 1970; 3 pp.

Vinegar is prepd. by fermenting EtOH in an aq. soln. contg. 10-1000 ml, thereby increasing the rate of fermn. Thus, 100 ml com. charging wort was placed in a flask and incubated at 30°, and added to this were 10 ml com. acetifying culture and 250 mg glycerol. After 5 days 6.0 g HOAc was produced.
CA, V. 78, 1973: 28206f

GREENSHIELDS, R.N.; JONES, D.D.
Glycerol-catalyzed vinegar manufacture. Ger. Offen 2,215,456 (Cl. C 12d), 04 Oct 1973, Appl. P 22 15 456.9, 29 Mar 1972; 7 pp.

AcOH prodn. by fermn. of EtOH was accelerated by adding 100-500 mg glycerol/100 ml soln.; this gave vinegar contg. no more glycerol than did com. prepns. Thus, 100 ml aq. alc. soln. obtained by brewers' yeast fermn. of malt wort yielded, on incubation at 30° and addn. of 10 ml com. culture and 250 mg glycerol, 6.0 g AcOH after 4 days as

compared with 6.1 g after 7 days in the case of a glycerol-free control.
CA, V. 80, 1974: 2450x

GROEGER, Th.
Disturbances in the wine vinegar process with especial reference to tropical conditions. Deut. Essigind. 1933, 37, 25-6.
CA, V. 28, 1934: 2120^4a

GUBOVA, V.
New submersion method of vinegar fermentation. (SKL Liptovsky Mikulas, Liptovsky Svaty Mikulas, Czech.). Kvasny Prum. 1974, 20(1), 6-9 (Slo).

A new vinegar fermn. method introduced in 1967 was tested. The yield of HOAc increased to >95% and vinegar prodn. increased considerably by pumping out half of the culture broth as a semiproduct (10% vinegar) as soon as the residual alc. concn. decreased to 0.3-0.2% and retaining the other half for inoculating the next load.
CA, V. 81, 1974: 24152z

HAESELER, G.
Whey vinegar. Branntweinwirtschaft 1947, no 1/2, 6 pp.

A sweet-whey paste (about 60% dry matter) was dild. with an equal amt. of water and heated for 1-2 hrs. at 100° in a steam sterilizer to ppt. protein. After filtration, a clear, brown liquid was obtained which contained about 27 g. lactose in 100 ml. This filtrate was dild. to about 12% sugar content and fermented in sterile flasks for 3 days at 30° with a lactose-fermenting kefir yeast to give an alc. content of 6.3 vol. %. The yeast inoculum was first propagated in whey soln. of 5% sugar content and then in 8% sugar soln. before being used in the final 12% soln. The vol. of whey was increased 5-10 times with each stage. No other substances were added to the whey solns. A sugar concn. of 16% yielded only 7.7% alc. in 17 days, with no higher yield after longer incubation. Yeast from a previous run could not be used as inoculum for a second run because it had become attenuated. The alc.-contg. whey solns. were filtered and then subjected to the Orleans type vinegar fermentation in small flasks. No fermentation took place in the undild. solns.; only a whey vinegar of 4% acid could be obtained from dil. whey solns. A pure whey vinegar of 10% acid could probably not be produced, but it is believed that a 5-7% vinegar could be made in com. generators. With whey of higher alc. content the vinegar fermentation probably would be adversely affected by the high salt content; a 5% whey vinegar already contains 1.5% mineral matter. The yellow-brown whey vinegar was similar to malt vinegar in character. It contained only a slight aroma suggestive of whey and a weak salty taste which was not detrimental to the quality or stability. No expts. were made with acid whey. Since whey contains only about 4-5% lactose, it is necessary to start with a concentrate to get at least a 5% whey vinegar, but in practice it would not be economical to use a paste such as was done here merely for a uniform, stable raw material. To avoid introducing foreign acids, no expts. were made by use of normal yeasts to ferment the sugar produced by acid hydrolysis of the lactose of whey. It was not possible to ferment whey directly to vinegar with

AcOH bacteria or to combine the alc. and vinegar fermentations by simultaneously inoculating with kefir yeasts and AcOH bacteria. It is unknown whether vinegar generators filled with shavings can be used to prepare whey vinegar. Because whey is a relatively rich medium and it is compulsory to work with low percentages of alc. and acid it may lead to slime formation and overoxidation in the generators, unless its high salt content prevents these taking place. A number of food-acidifying products, not truly whey vinegar, but produced wholly or in part from whey are briefly discussed: (1) whey distd. vinegar, (2) distd. vinegar obtained by adding unfermented sweet whey to the alc. mix before the vinegar fermented, (3) acid products based on lactic acid fermentation whey, (4) vinegar to which these lactic acid wheys are added (the addns. can be made either before or after the vinegar fermentation), (5) acid whey fortified with other acids such as tartaric, citric, concd. lactic, phosphoric, or mineral acid.
CA, V. 43, 1949: 6359g

HANSEN, A.E.
Making vinegar by the Frings process. Food Ind. 1935, 7, 277 & 312.

Recirculation of acid-alc. mix through the 14-by-15ft. Frings generator under controlled conditions increases production of white vinegar 30-fold over that of the standard 4-by-8-ft. noncirculating generator. The sealed construction of the generator prevents losses by evapn. and escaping vapors and results in increased yields. Room temp. does not affect the generator; hence the operation is uniform in all seasons. Because of a much larger vol. of mix passing through the shavings continuously, there is very little tendency toward sliming.
CA, V. 29, 1935: 7574 3

HOFFMANN, W.
The production of wine vinegars. Fruit Products J. and Am. Vinegar Ind. 1926, 5(110), 14-5.

This depends on how the wine is mixed bacteria of different kinds, and the progress of fermentation. The Orleans process makes superior vinegar.
CA, V. 20, 1926: 2716

ITAGAKI, T.; YAMATO, I.
Vinegar. (Nakano Vinegar Co.). Japan. 3041('55), May 4.

A mixt. of 23 l. 2.3% EtOH, 60 g. glucose, 1 l. of an ext, of sake cake, 6 g. $(NH_4)_2SO_4$, and 6 g. $NH_4H_2PO_4$ is sterilized at 70° for 30 min., cooled, and fermented with 3 l. of pure culture of AcOH bacteria at 29-31°, the concn. of EtOH being controlled at 3% with agitation and aeration. After 5 days, when the acidity has reached 4.2%, the mash is taken out and filtered to obtain the desired product. The process require only very short time for fermentation and no ripening process because the EtOH is converted to AcOH almost completely during the main fermentation. The EtOH and AcOH evolved are recovered continyously by condensation with cooling.
CA, V. 51, 1957: 14200d

KANEKO, T.; OHMORI, S.; et al.

Improved method for the discrimination between biogenic and synthetic acetic acid with a liquid scintillation counter. (Inst. Phys. Chem. Res., Wako, Japan). J. Food Sci. 1973, 38(2), 350-3 (Eng).

Preliminary work suggested that the variation in ^{14}C content of biogenic acetate was much smaller than expected from earlier reports. The ^{14}C content of fermn. EtOH was 21.0, 20.6, and 0 dpm/g C for biogenic EtOH from Wako Pure Chemical Industries, Osaka, biogenic EtOH made from molasses, and synthetic EtOH, resp. The ^{14}C content of acetate in a given vinegar can be estd. within 1-2% error in a single expt.Replicate and (or) repeated assays naturally give more reliable data. Thus, the ratio of synthetic to total acetate may be detd. with a few percent deviation. The natural radioactivity of CO_2 is not exactly const.,being influenced by weather, by Suess effect, etc., and continuously decreases. Preliminary tests on lactic and glutamic acids suggested that a liq. scintillation counter is also useful for the detn. of their ^{14}C contents.

CA, V. 78, 1973: 122758j

KEWPIE JOZO-KABUSHIKI KAISHA

Continous production of vinegar by surface fermentation. Brit. 1,305,-868.

A multistage surface fermn. process for the prodn. of AcOH is described. Eight fermn. vessels were interconnected in series, each vessel at approx. the same time as it stopped in the last vessel. Fresh EtOH-contg. liq. (e.g., denatured malt liquor) was added to the first vessel at the same rate as fermented liq. was withdrawn from the last vessel. Thus, during operation for 1 month a liq. with 0.22% alc. concn. and 5% acidity was obtained. The mean volumetric feed rate was 54.1 l./hr, the mean residence time in the vessels ~22.2 hr, the mean acidification rate ~94.7%. No bacterial contamination was obsd.

CA, V. 78, 1973: 122668e

KREIPE, H.

Determination of vinegar by the Katadyn process. Deut. Essigind. 1932, 36, 169-73.

The Katadyn process developed by Krause is based on the oligodynamic action of certain metals when applied in a high state of superficial distribution. Krause and others have obtained good results with this process in the sterilization of potable waters. Electrolytic expts. with Katadyn sand showed that this process is capable of degerminating both spirit and wine vinegar, during as brief a period as 15 sec. contact time. Subsequent infections are excluded in katadynized vinegar. The Katadyn treatment is furthermore effective in killing off vinegar eels.

CA, V. 26, 1932: 4129

KREIPE, H.

Theory and practice in vinegar production seventy years ago. Deut. Essigind. 1933, 37, 265-8.

CA, V. 28, 1934: 2120 3

LASKOWSKI, H.

The balance of alcohol in vinegar generators. Przemyst Rolny i Spozywozy 1954, 8, 194-7 (English summary).

The losses of alc. are mainly due to the complete bacterial oxidation to CO_2 and water. Losses are also due to evapn. and insufficient cooling of air in air condensers (57% loss of evapd. ethanol).
CA, V. 49, 1955: 2016g

LUCHOW

Indirect extract estimation in vinegar. Deutsche Essigind. 1926, 30, 233-4.

A discussion of the Tabrie formula and its adaptation to the indirect estn. of ext. in wine vinegar.
CA, V. 20, 1926: 3059

LUFRANO

Manufacture of wine vinegar, vinegar and acetic acid in Italy. Deutsche Essigind. 1926, 30, 190-1.
CA, V. 20, 1926: 2716

MALDONADO, O.; ROLZ, C.; et al.

Wine and vinegar production from tropical fruits. (Appl. Res. Div., Cent. Am. Res. Inst. Ind., Guatemala, Guatemala). J. Food Sci. 1975, 40(2), 262-5 (Eng).

Wine and vinegar were produced from tropical fruits at the lab. level by both batch and continuous processes. Trials were undertaken with pineapple, banana, tamarind, orange, blackberry, and cashew fruit juices. The continous prodn. of alc. was feasible at diln. rates of $D = 0.25$ to $0.04\ hr^{-1}$. Since continuous acetification was not successful at diln. rates of $D = 0.223$ to $0.0104\ hr^{-1}$, semicontinous and batch processes were used.
CA, V. 82, 1975: 110277w

MARINO, E.F.

Preparation of wine vinegars. A study of fermentation on, the basis of the quality of the product. (Centro Ampelographia Viticultura, Madrid). Bol. inst. nacl. invest. agron. (Madrid) 1956, 16, 47-74.

Fermentation expts. were carried out on synthetic mediums fortified with yeast ext. and EtOH to simulate an artificial wine of known compn., and also on natural wine. The effects of time and temp. on the fermentation and the quality of the product were studied. Methods are given for detg. the progress of vinegar formation from the aspect of the mycelium. Simultaneous detns. were made on the content of alc., acidity, and aldehydes and esters during the fermentations. The aldehydes and esters reached a max. when the alc. was half consumed. The quality of the vinegar is improved if the fermentation is stopped while there is still some alc. present.
CA, V. 51, 1957: 1528e

MAURICE, J.J.

Vinegar, etc. from brewing residues. Ger. 556,338, July 13, 1928, See Brit. 294,209 (C.A. 23, 1928).
CA, V. 26, 1932: 5699

MAYER, E.

Vinegar by oxidative fermentation of alcohol. (Hunt Foods, Inc.). U.S. 2,997,424, Aug. 22, 1961.

A continuous process is described for rapid fermentation of EtOH to AcOH, with a diagram of the app. used. Thus, a mash contg. 6% by wt. EtOH was mixed with a starting culture of Acetobacter in a 3400-gal. tank and circulated 300 gal./min. though an aerating system which supplied 20 cu.ft. of air/min. with rapid stirring. The temp. was kept at 80-95°F. The optimum concn. of Acetobacter was reached when the oxidn. was complete. From then on, the mash was run in at the top of the tank at 0.75 gal./min. and the AcOH soln. flowed from an outlet at the side at the same level as the liquid surface in the tank, yielding automatically 0.75 gal./min. of liquid of AcOH concn. equiv. to the EtOH in the mash.
CA, V. 55, 1961: 27770e

MECCA, F.

The iodometric determination of constituents of natural fermented vinegars. (Univ. Milan). Chimica e industria (Milan) 1953, 35, 70-2.

Constituents of wine vinegars present in small amts. were detd. as they developed during the course of fermentation and aging. Acetylmethylcarbinol content (higher in red wine vinegar than in white) rose with increase of AcOH, from zero to 170-200 mg./l. in 35 days in a vinegar with an AcOH content of 70 g./l. Diacetyl is present only is small amt., from a trace to 1.3 mg./cu. cm. Independent of the fermentation process and apparently present in the wine medium are reducing substances (Fehling), 3.6-5 g./100 cu. cm. and 2-3 butyleneglycol, 830 mg./100 cu. cm. In the detn. of diacetyl and acetylmethylcarbinol the methods of Janke and Popberger (C.A. 23, 2240) slightly modified by Pratolongo and Sartori (C.A. 41, 7644b) were used. By setting up norms of natural fermented vinegars it is possible to establish the artificiality of dil. AcOH solns. illicitly offered as natural products, unless, indeed, the rarer constituents are added with intent to deceive.
CA, V. 48, 1954: 6071c

MECCA, F.

Soluble nitrogen compounds in vinegar as a means of recognizing fermentation vinegars. (Univ. Milan). Chim. e ind. (Milan) 1958, 40, 20-2.

In the production of vinegar by fermentation the internal anhydride of monomethylguanidineacetic acid (I) is formed. Analyses of a no. of genuine wine vinegars reveal 150-230 mg.I/l. in vinegars of approx. 5% HOAc. Less than 150 mg.I/l. in a 5% HOAc vinegar is accordingly reason to suspect addn. of synthetic HOAc. A picramic index, i.e., mg. I/10 g. AcOH, of 30 is regarded as a similar lower limit. A colorimetric method involving reaction with alk. picrate is described for the analysis of I.
CA, V. 52, 1958: 7612e

MECCA, F.

New iodine number for differentiating fermentation and artificial vinegar. (Uffic. Controllo, Milan). Boll. Lab. Chim. Provinciali (Bologna) 1964, 15(6), 578-84 (Ital).

For detn. of the total I no., 10 ml. 0.1N iodide soln., 5 ml. 10% NaOH was added to 5 ml. vinegar. After standing overnight, 5 ml. 10% H_2SO_4 was added and it was titrated with $Na_2S_2O_3$, using starch indicator. The I no. was equal to X(12.7 X 200)/TA, where X was the ml. of 0.1N iodide soln. consumed in the reaction and TA was the total acidity as HOAc (g. %). For detn. of the fixed I no., 5 ml. vinegar was evapd. in a water bath to complete dryness. The residue was dissolved in water and the detn. continued as for total I no. Volatile I no. was calcd. by difference. Artificial vinegar (dil. HOAc) had a total I no. of 200-300, whereas natural vinegars had values of 2500-3400; decolorized vinegars had total I no. values of 2000-2500.
CA, V. 63, 1965: 2355b

NAGARATHNAMMA, M.; DWARAKANATH, C.T.; et al.
Changes in the chemical composition of the raw material during the preparation of vinegar. (Central Food Technol. Res. Inst., Mysore). Indian Food Packer 1964, 18(2), 4-7.

Vinegar was prepd. from the juice of purple and white grapes, apple, sugarcane, and cashew apple juices, and palm and cane jaggery. The final fixed acidity was about half of the acidity of the original material. Oxidn., I, and ester values went up and Ca and Fe contents decreased during prepn. of the vinegar. Vitamin C was eleminated from cashew apple juice during the prepn.
CA, V. 61, 1964: 12553e

NAKAYAMA, S.
Vinegar. II. Aeration fermentation process. Kagawa-Ken Hakko Shokuhin Shikenjo Hokoku 1973, 65, 48-52 (Japan).

The optimum conditions for vinegar fermn. using Acetobacter aceti were: initial alc. concn. ≤6%; initial acid degree ≤4%; and aeration 0.1 vol./vol./min. The max. yield of HOAc was 96.45% of the theor. value.
CA, V. 81, 1974: 48734s

NATHANAEL, W.R.N.
The history of vinegar production and the use of coconut toddy as a raw material. I. Historical introduction. (Coconut Research Inst. Ceylon, Lunuwila). Ceylon Coconut Quart. 1952, 3, 83-7.

The origin of vinegar production from coconuts and the chem. reactions involved are discussed. II. Coconut toddy, a raw material for vinegar production. Ibid. 135-49. The production of vinegar from coconut sap is discussed. The vinegar has d^{30}_{30} 1.010-1.015, 5-6% acid, <0.5% alc., 0.77-1.33% total solids, 0.37-0.45% ash, and 0.15-0.22% potash (as K_2O).
CA, V. 49, 1955: 559i

OKAMOTO, T.
Discrimination between brewed vinegar and synthetic vinegar. (Kagawa Prefect. Ferment. Food Exp. Stn., Uchinomi, Japan). Kagawa-Ken Hakko Shokuhin Shikenjo Hokoku 1969, (61), 44-6 (Japan).

Discrimination of brewed vinegar from synthetic vinegar was possible by considering synthetically the results of the brown ppt. formation

with I_2KI soln. The presence of amines, colorimetric detn. of pentose, uv absorption at 250-70 mμ in the absence of 5'-ribonucleotides as seasoning, and the no. and area of peaks found by gas chromatog. of head space vapor could be used as discriminatory criteria.
CA, V. 74, 1971: 52195q

OWENS, C.H.
Vinegar generator. U.S. 2,236,153, Mar. 25.

An arrangement of app. used comprises a generator tank adapted to recieve. The mixt. at its upper portion and collect the finished product in its lower portion, a plurality of raw-material tanks, drain pipes for the raw-material tanks connected to each other for mixing predetd. proportions of the mixt. as the same in drained from the respective tanks. means for regulating the temp. of the contents of the tanks before mixing thereof, means for regulating the temp. of the mixt. a purifying tank, a pump for forcing the mixt. upwardly through the purifying tank, means for regulating the temp. of the mixt. as it enters the purifier, a feed pipe leading from the rectifier to the generator and arranged to form a gas trap in the feed pipe and a pressure release pipe connecting the upper portion, of the purifier with the intake end of the pump and providing a recirculation system between the pump and the purifying tank for excess liquid fed to the purifying tank.
CA, V. 35, 1941: P4114^{8}

SIGMUND, R.
The total and actual acidity of vinegar. Fischwaren- u. Feinkost-Ind. 1951, 23, 85-6.

A theoretical discussion of the titration acidity and the pH and the factors influencing the latter. Vinegar prepd. from acetic acid shows a lower pH than fermentation vinegar of the same concn. This is due to the presence in acetic acid of formic and propionic acids, which dissociate to a greater degree.
CA, V. 49, 1955: 11233f

SPEAS, V.E.
Cider vinegar. (to speas Co.) U.S. 2,153,849, Apr. 11.

A method of prepg. a cider vinegar having a grain strength higher than normal and having substantially the flavor and aroma of a cider vinegar and having present there in malic acid and cider vinegar congeners in substantially the same percentages as in cider vinegar of normal grain strength comprises introducing a cider stock contg. natural alc. to a vinegar generator and subjecting the stock to an acetous fermentation therein until part of the natural alc. is converted to HOAc, gradually adding EtOH to the generator in an amt. not in excess of about 10% so that the stock undergoing acetous fermentation contains from about 2% to about 4% alc. and continuing the acetous fermentation of the fortified stock until a vinegar of the desired grain strength is produced.
CA, V. 33, 1939: 5590

STARZYK, J.

Distilled vinegar. Zwiazek Spoldzielni Spozywcow "Spolem". Pol. 46, 191, Sept. 29, 1962, Appl. Oct. 18, 1961; 2 pp.

A mash is prepd. from a fresh, unfiltered spent yeast wort, to which alc. 10-11 and HOAc 1-1% by vol. are added, followed by glucose 0.05-0.065, $(NH_4)_2HPO_4$ 0.022-0.025, KH_2PO_4 0.005-0.006, K_2SO_4 0.002-0.003, $MgSO_4$ 0.0005-0.0006%. The above salts are preferably dissolved in a small amount of the mash and then added to the rest of the soln.
CA, V. 59, 1963: 5742d

TAKEUCHI, T.; AMANO, T.; et al.

Vinegar. V. Improvement of rice vinegar. (Food Res. Inst., Japan). Aichi-Ken Shokuhin Kogyo Shikensho Nempo 1972, 13, 95-100 (Japan).

Sakes (4% vol./vol.) produced by using enzyme prepns. and by koji were similarly fermented to vinegars by Acetobacter at 30° without adding addnl. nutrients. The patterns of EtOH consumption, acid prodn., and aroma compn. were similar in both methods. The flavor and taste of vinegar from enzyme sake was equal to that from koji sake.
CA, V. 84, 1976: 29390x

b. Microorganism

GAMOVA-KAYUKOVA, N.I.

Selecting acetic bacteria for rapid vinegar production. (All-Union Research Inst. Canning Ind., Moscow). Mikrobiologiya 1950, 19, 137-46.

Of 4 Bacterium schuetzenbachii cultures, selected for sustained activity in high-acid vinegars, all did well at 7% but not all at 10% AcOH. A strain was grown which was active at 9-11% AcOH, in pure cultures, and at 8-10% AcOH in com. fermenters. Cultures for inoculating fresh fermenters can be prepd. as effectively, but not as economically, in semiworks fermenters, packed with shavings, as in pure sterilized mediums, at 8° Balling. Localized overoxidation is due to zones of low EtOH concn., which must be avoided.
CA, V. 44, 1950: 8047i

HARADA, T.; MORI, H.

Mutants of acetic acid bacteria used in vinegar production. (Inst.Sci. Ind. Res., Osaka Univ., Suita, Japan). Hakko Kogaku Zasshi 1971, 49 (10), 836-41 (Japan).

Acetic acid bacteria, strains S3 and F11, were isolated from the static and submerged fermentation tanks of vinegar at a com. plant, resp. When these strains were incubated statically in a culture medium contg. 3% EtOH, the pellicle formed by the strain S3 was stable and the culture medium was clear, while that formed by the strain F11 was easily broken and the culture medium was turbid. Thirty-three mutant strains were isolated. These mutant strains could be divided into 3 groups by their pellicle formation characteristics in a static culture in EtOH nutrient medium. In the strains of group I, the pellicle was stable and the culture medium was clear; in the strains of group II, an unstable, easily broken pellicle was formed and the culture medium was turbid;

and in the strains of group III, growth was not obsd. nor was a pellicle formed. In general, it was obsd. that the strains of group I showed a greater ability to produce HOAc from EtOH than did the strains of group II. No. correlation was obsd. between pellicle-forming character and tolerance to EtOH.
CA, V. 75, 1971: 150221k

IIBUCHI, S.; HATTORI, T.
Acetobacter for rice vinegar. Hakko Kyokaishi 1970, 28(10), 398-403 (Japan).

Forty-three stock cultures of Acetobacter and isolates from 95 samples of vinegar starter were screened for rapid HOAc production and 6 strains were selected. All of the 6 strains were rods and able to convert EtOH or glucose into HOAc or gluconic acid, resp., and were unable to oxidize HOAc. All 6 strains can be used in submerged fermentation. In submerged culture, the HOAc concn. reached 10% by adding EtOH several times during the log phase so as not to exceed 6% in the broth. Optimal culture conditions for stationary fermentation were also detd.
CA, V. 75, 1971: 47621s

IWAI, M.; IMAHARA, H.; et al.
Halophilic lactic acid bacteria in fermentation food making. IV. Nutrient requirement of lactic acid bacteria and yeasts in suguki making. (Fac. Agric., Kyoto Prefect. Univ., Kyoto, Japan). Kyoto Furitsu Daigaku Gakujitsu Hokoku, Nogaku 1971, (23), 163-7 (Japan).

Yeast was isolated from "suguki" (a type of pickles in Kyoto) to study its role together with lactic acid bacteria (I) (reported previously) in suguki digestion. The isolated yeast was identified as Saccharomyces rouxii (II). Addn. of both I and II resulted in a better product than did the sole addn. of I. Investigation of the nutrient requirements of I showed that it required B-vitamins such as pyridoxine (III), nicotinic acid (IV), panthotenic acid (V), p-aminobenzoic acid (VI), and biotin (VI), and 17 amino acids except proline. II required noly vitamins, thiamine, III, IV, and VI in case of $(NH_4)_2SO_4$ as the N source, and addnl. V in case of amino acids.
CA, V. 78, 1973: 41809z

JEFFREYS, G.
Live lactic acid bacteria cultures. A. U.S. 3,677,897 (Cl. 195-55; C 12k, A 21d), 18 Jul 1972, Appl. 68,520, 31 Aug 1970; 6 pp.

A method is given for prepg. dried, stable starter cultures of live lactic acid-producing bacteria for use in fermentations. Cultures cited in the examples include Lactobacillus delbrueckii, L. bulgaricus, Streptococcus lactis, L. thermophilus, L. plantarum, L. bifidus, and L. acidophilus. The bacteria are grown in a nutrient medium and then coated for preservation by emulsifying the medium with an acetylated monoglyceride having a m.p. of 35-45°. The emulsified medium is then blended with a carrier of food ingredients contg. glucose, modified starches, and modified cellulose. It is dried at <110°F and cooled to encapsulate the bacterial cells, yielding a preserved culture. Myvacets (5-00, 7-00, and 7-07) were used as emulsifiers. They formed a waxy protective film.
CA, V. 77, 1972: 125063u

LOITSYANSKAYA, M.S.

Bacterial utilization of glucose in accelerated production of vinegar. (A. A. Zhdanov State Univ., Leningrad). Mikrobiologiya 1955, 24, 598-607.

The inferiority of glucose as a nutrient for Bacterium schüzenbachii, B. curvum, or Acetobacter aceti in the accelerated method for making vinegar is not due to N deficiency. Even with nitrates, NH_4 salts, peptone, asparagine, and yeast water with its vitamins or vitamin derivs. in the medium, growth is poorer on glucose than on EtOH, acetates, or lactates. Tests with B. schüzenbachii indicate that it is also not due to an unfavorable pH range. The oxidation-reduction potential does not fall below 14 with acetic organisms either in glucose solns. or in more favorable media. Oxidation of glucose is even more active in the nonproliferating state than with proliferation in progress. In media contg. glucose along with EtOH, AcOH, or lactic acid, cultures of B. schüzenbachii during the proliferation period ferment glucose without forming gluconic acid, apparently utilizing it in cell metabolism. In the nonproliferating state glucose is oxidized to gluconic acid. In 4-day cultures, each supplying the same wt. of C (one as glucose, the other as EtOH), the cell counts (in millions per 30 sq.cm.) reached 832 with glucose and 19,050 with EtOH.
CA, V. 50, 1956: 8961c

NAKAYAMA, S.

Vinegar. I. Behavior of acetic acid bacteria on surface culture. Hakko Kyokaishi 1973, 31(2), 64-9 (Japan).

Thirty-seven acetic acid bacteria were isolated from vinegar factories and fruits in Kagawa Prefecture, Japan. Seven grew in 4% alc. and 2% HOAc, and were studied in detail. These were tentatively identified as Acetobacter aceti (3 strains) and a strain each of A. pasteurianus, A. rancens, A.suboxydans and A. acetosus. KH_2PO_4, $MgSO_4$, pantothenic acid, nicotinic acid, and biotin increased the yield. The optimal conditions were: HOAc, 2%; temp., 30°; inoculum size, 1/10 of logarithmic phase culture.
CA, V. 79, 1973: 144850f

NAKAYAMA, S.

Vinegar. I. Behavior of acetic acid bacteria in surface fermentation. Kagawa-Ken Hakko Shokuhin Shikenjo Hokoku 1973, 65, 39-47 (Japan).

The optimum conditions for surface fermn. of vinegar using Acetobacter were as follows: the vol. ratio of yeast mash to alc. 2-2.5:1; 0.1% KH_2PO_4 and $MgSO_4$, and pantothenic acid as growth factors; alc. concn. 4-6%; mash acidity 2%; fermn. temp. 30°; and the surface area (m^2/100 l.) multiplied by the days of fermn. should equal 5.
CA, V. 81, 1974: 48733r

NOTKINA, L.G.

Circulation method for biochemical vinegar production. (Ukrainian Sci. Research Inst. Food Ind., Kharkov). Voprosy Pishchevoi i Brodil'noi Mikrobiol., Inst. Mikrobiol. im. K.D. Zabolotnogo, Akad. Nauk Ukr. S.S.R., Soveshchanie, Kiev, 1956, 136-8(Pub. 1958).

A new production method, utilizing the existing small (1-2 cu.m.) Schützenbach wooden oxidizers for the vinegar from alc. process was developed at N.'s Institute by Annenkov, Zhukov, and Kazhdan in 1949. It is based on the mix circulation; 200-300 l. of alc. soln. are used in each cycle. The mix is maintained at 28-30° and pumped at the rapid rates of 60, 80, or 100 l./hr. to tanks filled with wood shavings and contg. acetic acid bacteria. The same temp. is kept throughout the shavings, and 3-5 kg. AcOH or 85-90 kg. vinegar are produced per cu.m. of the shavings space. Further developments include addns. of 0.7-08% AcOH to the mix. This leads to vinegar concns. of 10%, and resulted in the selection of the more active strains and acceleration of the oxidn. process. The use of ceramic vessels to cut the evapn. from the wooden ones is investigated. Replacement of the small tanks by large ones is now in progress in several Soviet plants. The deep-type alc. oxidn. process was basically solved at the same institute in 1948-49 by Kozlovskii, Rybalka, and Kitaigorodskii; but the process details are still to be worked out.
CA, V. 53, 1959: 20683h

OKADA, Y.; TAKEUCHI, T. et al.
Vinegar. I. Media in vinegar manufacture. (Food Res. Inst., Japan). Aichi-Ken Shokuhin Kogyo Shikensho Nempo 1972, 13, 61-73 (Japan).

Vinegar was produced by Acetobacter no.1 (H1), no.2 (H2), Acetobacter ascendens (S3) and A. aceti (S5) in media contg. yeast ext., peptones, Casamino acids, sake lees, and other nutrients at 30°. The yield of vinegar was higher when the initial EtOH concn. in the medium was low. When the EtOH concn. was >8-10% or HOAc concn. was >1% initially, the growth of Acetobacter was inhibited. Addn. of sake lees, yeast ext., and peptones to the media shortened the induction period and increased the yield. Except for S3, addn. of vitamins did not further promote growth. Supplements of org-N and other nutrients were required for a full growth.
CA, V. 84, 1976: 29389d

SHAINSKAYA, I.M.
Developing and selecting active cultures of acetic acid bacteria for producing fermentation vinegar. (All-Soviet Research Inst. Canning Ind., Moscow). Mikrobiologiya 1953, 22, 72-8.

Of 20 cultures from the most productive fermenters in various vinegar works, 10 formed thick, firm pellicles while 10 formed thin, friable pollicles; but all were active producers of AcOH. The chief organisms were Bacterium curvum and B. schuezenbachii. Thin, friable, bluish pellicles of B. curvum were selected for growing the pure cultures to start the fermenters in a new vinegar works.
CA, V. 47, 1953: 12747f

c. Fermentation Studies

BERTIN, C.
Differentiation of fermentation and artificial vinegars ann. fals. 1932, 25, 412-13.

Fermentation vinegars always contain methylacetol (AcCH-(OH)Me), which can be detd, quantitatively by the following modification of Pastureau's test: Neutralize 50 cc. of vinegar with Na_2CO_3 dist. 20 cc; to the distillate add 19 cc. $CuSO_4$ soln. (40 g. $CuSO_4 \cdot 5H_2O$ and 1 cc. H_2SO_4 per 1.) 10 cc, Rochelle salt (200 g. per 1.) and 5 cc. K $Fe(CN)_6$ (50 g. per 1.) heat to boiling and titrate the unreduced Cu with standard glucose soln.; titrate similarly a mixt. of the 3 above reagents and 20 cc. distd. water. The difference between the 2 titrations gives the glucose equiv. of the metylacetol in the vinegar. The detn. requires about 30 min.
CA, V. 26, 1932: 5697

DINGEMANS, J.J.J.
Fruit vinegar, fermentation vinegar and synthetic vinegar. Chem. Weekblad 1933, 30, 781; cf. C.A. 27, 3285.

With a vinegar prepd. synthetically by addn. of a few drops of acetylmethylcabinol to a soln. of AcOH when the Schiff reaction is neg. or faintly pos., Pratolongo's method gives a sufficiently accurate indication of the true nature of the product. If the Schiff reaction is neg. or faintly pos. and the detn. of alc. by the Pratolongo method reveals only traces of carbinol, it can be concluded that the sample contains little or no fruit vinegar. If the Schiff reaction is clearly pos. and the product has an appreciable Pratolongo no., it can be concluded that it contains a high proportion of fruit vinegar. It should be noted, however, that this latter conclusion can be erroneous in the case of a product to which has been added insufficiently acidified alc.
CA, V. 28, 1934: 5173^6

GREENSHIELD, R.N.
Vinegar by fermentation of alcohol. Ger. Offen. 2,205,638 (Cl. C 12j), Aug 1973, Appl. P 22 05 638.8, 07 Feb 1972; 12 pp.

Vinegar was continuously prepd. by fermn. of EtOH with Acetobacter rancens in a vertically oriented cylindrical vessel, whereby air was passed in at the bottom of the vessel just below a separatory sintered glass bottom, the soln. moved to the top of the vessel, and the EtOH concn. was higher at the bottom and the HOAc concn. was higher at the top of the vessel in the stationary state. Thus, an aq. 4.6% EtOH soln. was passed into a cylindrical vessel (height 1.52 m, diam. 7.6 cm, vol. 4 1.) at 30°, air was passed into the vessel at 2.5 1./min, the soln. inoculated with 200 ml A. rancens culture, and the fermn. proceeded 117 hr, to give a 5.19% HOAc soln. at 86.5% conversion. After continuous operation for 19 days at 4 1. EtOH soln./day, a soln. contg. 4.17% HOAc was obtained at 69.5% conversion.
CA, V. 79, 1973: 135528e

HEINTZE, K.
Stability of sorbic acid under the conditions of submersed vinegar fermentation. (Inst. Chem. Technol., Bundesforschungsanst. Lebensmittelfrischhalt., Karlsruhe, Ger.). Ind. Obst- Gemueseverwert. 1973, 58 (7), 187-8 (Ger).

To det. the effect of fermn. on sorbic acid content, possible prodn. of toxic by-products, or inhibitory effect of sorbate on fermn. model

expts. were conducted. Solns. of 250 mg sorbic acid/l. in 6% HOAc; 6% HOAc-4% EtOH-500 mg/l. $(NH_4)_2SO_4$; and wine vinegar-red wine (1:1) were intensively aerated for 48 hr and then analyzed for sorbic acid by the thiobarbituric acid method. Since a decrease of only 2.4, 3, and 2.7% was found for the 3 solns., resp., the sorbic acid decompn. products can only be of minor importance.
CA, V. 79, 1973: 41049x

HROMATKA, O.; EBNER, H.
Investigations on vinegar fermentation. I. Generator vinegar fermentation and aeration procedures. (Weinnessigfabrik Anton Enenkel, Traun bei Linz, Austria). Enzymologia 1949, 13, 369-87 (in German).

A simple manometric method permits the measurement of O uptake of AcOH bacteria on beechwood shavings. The O consumption in generator vinegar fermentation is a linear function of time. EtOH has been oxidized to AcOH in submerged fermentation for the first time; acid formation is an exponential function of time. This new method permits 30 times faster fermentation of the same amt. of substrate. The AcOH bacteria during submerged exponential fermentation had an av. Qo_2 = 7750 ml. O_2/g. dry wt./hr. 120 references.
CA, V. 44, 1950: 6079f

HROMATKA, O.; EBNER, H.
Investigations on vinegar fermentation. III. Effect of aeration on submerged fermentation. (Univ. Vienna). Enzymologia 1951, 15, 57-69 (in German); cf. C.A. 45, 6793d.

Aeration is most effective when very small air bubbles are formed (as in Jena G-4 porous sinter plates). In submerged fermentation, pure O or 60% O-40% N are harmful; in generator fermentation, pure O is not toxic. Other tech. details are given.
CA, V. 47, 1953: 3514f

HROMATKA, O.; KASTNER, G.; et al.
Investigations on vinegar fermentation. V. Influence of temperature and total concentration on the submerged fermentation. (Univ. Vienna). Enzymologia 1953, 15, 337-50 (in German); cf. C.A. 47, 5067a.

The effect of varied temps. was evaluated by the length of the fermentation period from inoculation of the mash to complete conversion of EtOH to AcOH, or by the time needed for the reduplication of during the log phase of fermentation. The latter value is not only temp.-dependent, but also dependent on the total substrate concn. The optimal fermentation temp. is roughly inversely proportional to this total concn.
CA, V. 47, 1953: 6598d

HROMATKA, O.; POLESOFSKY, W.
Vinegar fermentation. VI. Oxidation of monofunctional primary alcohols. (Univ. Vienna). Enzymologia 1962, 24, 341-59; cf. CA 47, 6598d.

Submerged vinegar fermentation, applied to the oxidn. of PrOH, n- and iso-BuOH, and iso-AmOH with Acetobacter suboxydans, was preferable to surface culture, shake flask growth, or resting bacteria methods.

VII. Oxidation of various primary alcohols and glycols. Ibid. 372-84.

Under the conditions elaborated above, this strain of A. suboxydans oxidized β-phenylethanol to phenylacetic acid; furfuryl alc. to pyromucic acid; ethylene glycol to glycolic acid (but not to oxalic acid); 1,3-propanediol to hydroacrylic acid (predominantly), malonic acid,and CO_2; 1,4-butanediol to γ-hydroxybutyric acid, succinic acid, and CO_2; 1,6-hexanediol to ε-hydroxycaproic acid and adipic acid; $EtOCH_2CH_2OH$ to ethoxyacetic acid; diethylene glycol to diglycolic acid and β-hydroxyethoxyacetic acid; and diethylene glycol monomethyl ether to β-methoxyethoxyacetic acid. No oxidn. was observed with allyl alc., ethanolamine, N-formylethanolamine, diethylaminoethanol, ε-aminohexanol, ethylene chlorohydrin, monothioethylene glycol, ethyl β-hydroxyethyl sulfide, or 1,4-butynediol.

VIII. Further data on interruption of aeration. Otto Hromatka and Wolfgang Exner. Ibid. 25, 37-51; cf. CA 47, 5067a.

Tech. details on the effect of interruption of aeration under various conditions on the yield are presented.

IX. Effect of carbon dioxide on submerged vinegar fermentation. Otto Hromatka, Gerhard Kastner, Hannes Gsur, and Theodor Gruber. Ibid. 52-64.

During submerged fermentation with pure alc. mashes, removal of CO_2 from the air phase was damaging. Fermentation rate was sometimes improved by increasing the CO_2 content to 37 vol. %. Final oxidn. of AcOH did not take place under these conditions.

X. Organic compounds as sources of carbon dioxide. Otto Hromatka, Gerhard Kastner, Theodor Gruber, and Hannes Gsur. Ibid. 65-72.

Fermentation was improved by the addn. of MeOH or urea. Et_2CO_3, urotropin, and pyruvic acid did not exhibit this effect. Addn. of glucose to the medium partially prevents the damage caused by CO_2-free aeration.

XI. Development of an apparatus for experiments with C^{14}-labeled carbon dioxide. Otto Hromatka and Hannes Gsur. Ibid. 73-9.

A horizontal rotary shaker was found suitable.
CA, V. 58, 1963: 5005gh

HRONCEK, J.

Vinegar fermentation. Kvasny Prumysl 1955, 1, 230-2.

Bacteria which can oxidize the alc. by means of submersion fermentation were isolated. The rate of oxidation by the submersion method is essentially higher than that of procedures used now. 12 references.
CA, V. 52, 1958: 3250c

INABA, K.

Vinegar preparation through aerobic fermentation. (Marukan Vinegar Co., Ltd.) Japan. Kokai 73 13,597 (Cl. 36(5)E3), 20 Feb 1973, Appl. 71 48,095, 02 Jul 1971; 3 pp.

A microbial prodn. of vinegar included oxidn. of EtOH with HOAc bacteria in aerated medium. HOAc bacteria were cultivated in a 1000 l.

culture medium contg. 50 kg EtOH at 35° and aeration was kept at 50 l. of air contg. 40% O_2/min after 35 hr. A 7.2% yield was obtained after 51 hr of incubation.
CA, V. 78, 1973: 158046q

ITO, H.; EBINE, H.
Discrimination between fermented vinegars and synthetic vinegars. III. Detection of neutral components in vinegars by gas chromatography. (Natl. Food Res. Inst., Tokyo, Japan). Nippon Jozo Kyokai Zasshi 1975, 70(4), 271-6 (Japan).

Neutral components of the fermented vinegars, rice, sake cake, alc., malt, cider, and wine vinegars, were analyzed by gas chromatog. and compared with those of the synthetic vinegars. EtOH, acetoin, EtOAc, MeCHO, octyl alc., and 2,3-butylene glycol were detected in comparatively large amts., in decreasing order, in the fermented vinegars. Small amts. of BuOAc, amyl acetate, isoamyl acetate, iso-BuOH, isoamyl alc., and furfural were detected in the fermented vinegars. In the synthetic vinegars, Me_2CO, iso-BuOH, n-heptyl alc., and an unknown compd. were detected; phenylacetaldehyde, EtOH, EtOAc, octyl alc., 2,3-butylene glycol, and furfural were detected in some of them. Diacetyl, PrOH, acetoin, amyl acetate, isoamyl acetate, and isoamyl alc. were not detected in the synthetic vinegars.
CA, V. 83, 1975: 176827c

NAKAYAMA, S.
Vinegar. III. Continous aeration fermentation. (Kagawa-ken Hakko Shokuhin Shikenjo, Japan). Hakko Kyokaishi 1974, 32(9), 393-7 (Japan).

A conventional vinegar fermenter (Azuma Vinegar-Plant FJ-120) was tested on its effectiveness for continuous vinegar fermn. with vigorous aeration. Some improvements were recommended in its stirring and sparging systems.
CA, V. 81, 1974: 167831f

NAKAYAMA, S.
Vinegar. IV. Carbon/nitrogen ratio in the aeration process of vinegar production. (Kagawa-Ken Hakko Shokuhin Shikenjo, Kagawa, Japan). Hakko Kyokaishi 1975, 33(8-9), 273-80 (Japan).

The optimum C [7440-44-0]/N [7727-37-9] ratio for good vinegar prodn. by Acetobacter aceti was glucose/total N = 6-7, alc./total N = 100, glucose/alanine + asparatate + glutamate = 4-5, and alc./alanine + aspartate + glutamate = 70-80. For high acidity vinegar (>10% AcOH) prodn., addn. of 35 mg/ml each of glutamate, alanine, and aspartate to the medium gave a good result. Addn. of glutamate, alanine, or aspartate shortened the lag time, but arginine had no effect. Amino acid seepage from the microbial body increased as the alc. concn. increased. In the order of their concns., glutamate, aspartate, arginine, and alanine were present in the bacterial cells.
CA, V. 84, 1976: 29372t

OKUNUKI, K.; NAKAYAMA, B.
Vinegar manufacture by tank fermentation. Japan. 10,697('60), Aug. 6.

To a mixt. of peptone 0.6, yeast ext. 0.3, glycerol 3, glucose 3 g., and AcOH 6 cc., 300 cc. H_2O and EtOH were added. The mixt. was inoculated with AcOH bacteria, cultured at 30° for 30 hrs., and then shaken at 35° for 15 hrs. to give a bacteriae soln. Wine cake (80 kg.) was extd. with 200 l. H_2O. The ext. was sterilized with steam, placed in a tank, treated with 152 l. EtOH, 72 l. AcOH, and enough H_2O to make 3600 l. of soln., warmed at 35°, treated with 2 l. inoculum, cultured under aeration of 100 l./min. for 30 hrs. and then 300 l./min., and kept at 37 ± 1° to give 3456 l. of 61% AcOH soln.
CA, V. 55, 1961: 8758c

TAKEUCHI, T.; YOSHIDA, M.; et al.
Vinegar. IX. Characteristics of vinegar produced by a new fermenter with multi-air-chambers. (Food Res. Inst., Japan). Aichi-Ken Shokuhin Kogyo Shikensho Nempo 1972, 13, 122-9 (Japan).

Vinegar manufd. by a new fermenter with multi air-chambers was compared to that manufd. by static fermn. and by aerobic fermn. The amino acid compn., and odorous substances were similar in all 3 prepns. The consumption of glucose was highest in aerobic fermn. Asparagine, glutamic acid, and serine contents were decreased, whereas ninhydrin-pos. high-mol.-wt. substances were similar in all products.
CA, V. 84, 1976: 29392z

TELLEGEN, F.P.A.
Wine vinegar, fermentation vinegar and white vinegar. Chem. Weekblad 1933, 30, 780-1.

The tests described by Dingemans (C.A. 27, 3285) are insufficient to differentiate wine vinegar (I) from fermentation or white vinegars. Although it has been claimed that formation of acetoin (II) in vinegar depends on the method of prepn., and methods are stated to be known whereby I can be obtained in which II is absent, no such authentic specimens have been met with by T.
CA, V. 28, 1934: 4832^6

WAHID, M.A.; CHUGHTAI, M.I.D.
Chemical activities of microorganisms. VII. Acetic acid (vinegar) for indigenous raw materials. (Inst. Chem., Panjab Univ., Lahore, Pak.). Pak. J. Sci. Res. 1969, 21(3-4), 88-93 (Eng).

Molasses, gur, and dried grapes were utilized to judge the efficiency of different microbial strains with respect to some std. medium. Sucrose-contg. nutrients were also used. A pure strain of yeast, 2 of Acetobacter, and a natural yeast isolated from local grapes were used. In all fermenting mashes the percentage of EtOH formed was highest on the second day (low value with grapes). With molasses and gur, nutrients were added with Saccharomyces ellipsoideus NRRL 1912, while with grapes, no nutrients were added and the fermentation was done with the natural yeast strain. Thus, nutrients and a selected yeast strain had a favorable effect on the production of EtOH from a sugary material. During the fermentation the acidity of the fermenting medium increased, with corresponding increase in the quantity of EtOH produced. During acidification, if less than 10% mother of vinegar was added, the medium was infected by other bacteria or molds. Zooglea formed on the surface of

the fermenting medium after 10-15 days. If disturbed, it sank to the bottom with slowing of AcOH production. Despite the new film formed on the surface after a few days, the sinking of the first layer resulted in a redn. of yield.
CA, V. 75, 1971: 87075y

WALTER OBST
Vinegar is like honey a biological conception, applicable only to the natural product. Deut. Essigind. 1933, 37, 65-6.
CA, V. 28, 1934: 21204b

YANAGIDA, F.; ASANO, M.; et al.
Acetic acid bacteria and their utilizations. IV. Application of diethyl pyrocarbonate for vinegar production as a bactericide. (Dep. Brew., Tokyo Univ. Agric., Tokyo, Japan). Nippon Jozo Kyokai Zasshi 1972, 67 (1), 66-70 (Japan).

When 25 ppm diethyl pyrocarbonate (DEPC) and 0.5% HOAc were used at the same time, 10^6 microorganisms/ml were killed in the sake cake extn. The batch and semi-continuous fermentations progressed safely after sterilization of the materials for vinegar production by both DEPC and HOAc. The fermentation was stopped by addn. of 100 ppm DEPC during the vigorous fermentation period, and 50 ppm was enough to stop the fermentation at the early or later period of the fermentation. However, addn. of 300 ppm DEPC was required to stop the fermentation of the moromi contg. more bacteria as in the case of shaken culture. DEPC (200 ppm) was decompd. completely in vinegar after 8 hr. When DEPC was added to fermenting materials contg. EtOH, diethyl carbonate (DC) occurred in the moromi mash. DC hindered the acid formation in the moromi mash at an early period but did not at a later period.
CA, V. 77, 1972: 112584q

YANAGIDA, F.; TAKAHASHI, K.; et al.
Acetic acid bacteria and their utilization. IX. Free amino acids in the fermenting vinegar mash. (Dep. Brew., Tokyo Univ. Agric., Tokyo, Japan). Nippon Jozo Kyokai Zasshi 1973, 68(2), 130-4 (Japan).

Changes of amino acid content in the mash were followed during the prodn. of rice, sake cake, malt, cider, wine, and alc. vinegars. Almost all amino acids decreased during fermn., esp. glutamic acid, aspartic acid, proline, and alanine. Total amino acids decreased to 38-60% of the starting amts. Amino acids increased 1.6-2.6 times in the rice vinegar fermn., because the starting material contained rice grains, the proteins of which seemed to decomp.
CA, V. 78, 1973: 146278d

YANAGIDA, F.; TAKASHIMA, K.; et al.
Utilization of acetic acid bacteria. II. Free amino acids in vinegars. (Dep. Brew., Tokyo Univ. Agric., Tokyo, Japan). Nippon Jozo Kyokai Zasshi 1971, 66(12), 1185-9 (Japan).

Free amino acids in vinegars were detd. by an amino acid analyzer. Amino acid contents were 20-50 mg/100 ml in sake cake, cider, and wine vinegars and 140-280 in rice vinegar. The amt. in malt vinegar was intermediate between rice and sake cake vinegars. Alc. vinegar con-

tained only 3-15 mg/100 ml. Glutamic acid, glycine, lysine, alanine, aspartic acid, and valine generally predominated, but some variations in the amino acids content were found among the samples (e.g., tryptophan was not detected in wine or rice vinegars, and methionine and orginine were missing in wine and malt vinegars, resp.).
CA, V. 76, 1972: 111617v

d. Its Component

ADRIANO, F.T. and BANZON, J.
Characteristics of Philippine vinegar. Phil. J. Agriculture, 1933, 4: 229.

Local vinegars have characteristics of their own. They have low acetic acid content averaging 2.9%; the palm vinegars generally have a very low sugar content while cane-juice vinegars are very high in sugar. The palm vinegars, the nipa samples, especially, have a very high percentage of soluble ash in the total ash.
Nutr. Related Topics, 1953: 7.

ANONYMOUS
Vinegar to be controlled food, and quality, standard of coloring, and labelling of vinegar. Royal Thai Government Gazette, 1972, 89 (17), 315-317

This Notification prescribes that vinegar is to be classified as a controlled food and lays down standards for vinegar (in particular, there must be no sulfuric acid or other free mineral acid, no sediment, and no added colouring matter). Water used for diluting vinegar must satisfy the physical, chemical, and bacteriological requirements indicated.
Author.

ASANO, S.; TSUJI, H.; et al.
Vinegar compositions. (Kyowa Fermentation Industry Co., Ltd.) Japan. 71 42,199 (Cl. C 12j, A 231), 13 Dec 1971, Appl. 18 May 1967; 3 pp.

Alanine and Na aspartate (0.05-1% each) are added to vinegar to raise the soly. of Na glutamate and thereby improve the flavor. Thus, 10% aq. AcOH contg. Na glutamate 2, citric acid 1, saccharin 0.4, Na cyclamate 0.25, alanine 0.2, and Na aspartate 0.5% was clear for >1 month.
CA, V. 76, 1972: 57959t

AURAND, L.W.; SINGLETON, J.A.; et al.
Volatile components in the vapors of natural and distilled vinegars. (North Carolina Agr. Expt. Sta., Raleigh). J. Food Sci. 1966, 31(2), 172-7 (Eng).

Five com. vinegars and 3 vinegar samples from pickle companies were analyzed. The former samples consisted of apple cider vinegar, grape wine vinegar, a mixt. of distd. and malt vinegars with tarragon spices, and 2 distd. vinegars. As many as 20 volatile components were detected,

i.e. in the tarragon vinegar. AcH, Me_2CO, AcOEt, and EtOh were detected in all of the samples. The natural vinegars contained the largest no. of volatile components. Five of the 8 vinegar samples contained AcH, Me_2CO, and Ac_2; the Ac_2 content of the distd. vinegar samples was minor. The natural fruit vinegars (cider and wine) contained several alcs., such as EtOH, PrOH, AmOH, iso-AmOH, and sec-BuOH, while the distd. vinegars contained only EtOH and BuOH isomers and AmOH. Esters made up the largest group of volatile flavor compds., including HCOMe, HCOEt, AcOEt, $EtCO_2Et$, butyl acetates, and isoamyl acetate. The importance of the volatiles to vinegar flavor is discussed.
CA, V. 64, 1966: 18318e

BARSCH, H.
Simple test for slop vinegar in wine vinegar. Pharm. Zentralhalle 1933, 74, 599-600.

Shake vigorously for 1 min. 20 cc. of the sample in a closed 50 cc. cylinder. If the product contains 5% or more vinegar from brewer's grains or slops, a thick fine-pored white foam will appear at the surface permanent for a period of 1/2 hr. to several hrs., depending on the amt. of added slop vinegar. On similar treatment pure wine vinegar yields a coarse-grained, very loose and thin film of bubbles wich rapidly disappear. The peculiar behavior of slop vinegar may be due to the presence of saponin.
CA, V. 28, 1934: 251^8

BERGER, W.G.; HERRMANN, K.
Catechins and their degradation products in grapes, husks, vinegar-wines, and corresponding vinegars. I. Qualitative identification and quantitative determination of catechins. (Tech. Univ. Hannover, Hanover, Ger.). Z. Lebensm.-Unters.-Forsch. 1971, 146(5), 266-74 (Ger.).

After referring to the available literature the article describes how a suitable crude ext. is obtained as well as its purification by chromatog. on a polyamide column and the purification and sepn. of the catechins by 2-dimensional cellulose thin-layer chromatog. with 2% aq. HOAc and BuOH-HOAc-H_2O (4:1:2.2). For quant. detn. 2 spectrophotometric methods have been developed: detn. by uv spectrophotometry and detn. by the vanillin-HCl reaction. Both methods, which show a high amt. of agreement, allow the detn. of single catechins.
CA, V. 75, 1971: 128559e

BERGER, W.G.; HERRMANN, K.
Catechins and their degradation products in grapes, husks, vinegar-wines, and corresponding vinegars. II. Qualitative and quantitative investigation of vinegar-wines and vinegars. (Tech. Univ. Hannover, Hanover, Ger.). Z. Lebensm.-Unters.-Forsch. 1971, 146(5), 275-80(Ger.)

In all wines D-catechin, L-epicatechin, D-gallocatechin and L-epigallocatechin could be detd. Qual. differences between the catechin contents of vinegar-wines and the corresponding crude vinegars were not found. The quant. anal. shows that the total catechin content during the fermentation is reduced to ~$^1/_3$ of the original value. The reaction of the single catechins in this oxidn. process was different; thus the redn. of the pentahydroxy-flavan-3-ols (D-gallocatechin, L-epigallo-

catechin was higher (≲90%) than that of the tetrahydroxy-flavan-3-ols (50-60%). Finally the quant. methods for the identification of after-wines are discussed.
CA, V. 75, 1971: 128631x

BUCCI, F.
Iodine number of wine vinegars. Rend. ist. super sanita (Rome) 1948, 11, 743-54.

The value of the I no. as a criterion to detect adulteration of wine vinegars was studied. Generally, the I no. of wine vinegars is above 2000, while that of a common adulterant, artificial vinegar, is much below 1000. However, numerous substances normally present in wine vinegars affect the I no. The variations caused by addn. of these substances, e.g. glycerol, glucose, or caramel and also of of artificial vinegar, are shown. In view of the many variables affecting the I no., the latter can not be considered as a rigid criterion to det. adulteration of wine vinegars. Also in Ann. chim. applicate 38, 349-59(1948).
CA, V. 43, 1949: 3969g

CESARI, A.; CUSMANO, A.M.; et al.
Determination of acetoin and diacetyl in vinegar by gas chromatography. (lst. Super, Sanita, Rome). Boll. Lab. Chim. Provinciati (Bologna) 1964, 15(5), 444-50 (Ital.).

Acetoin and diacetyl can be detd. in vinegar by gas chromatography with a sensitivity of 10 mg./1. by direct comparison of the chromatograms of vinegars and standard solns. of different concns. of acetoin and diacetyl.
CA, V. 62, 1965: 9699e

COPPINI, D.; MONZANI, A.; et al.
Modena balsamic vinegar. (Ist. Chim Farm. Tossicol., Univ. Modena, Modena, Italy). Atti Soc. Nat. Mat. Modena 1973, 104,137-42 (Ital).

Some samples of 15-100-year-old Modena balsamic vinegar (a wine vinegar) and 3 samples of vinegar residues >100 years old were analyzed. Ranges were (in mg/100 ml for balsamic vinegar samples, and in mg/100 g for the vinegar residues, resp.): diacetyl 1.96-6.06 and 2.07 -4.49; acetylmethylcarbinol 24.91-42.91 and 19.18-133.79; 2,3-butylene glycol 45.06-239.33 and 96.72-431.4; MeCHO 7.78-13.78, and 7.43-28.16; histidine 13.74-17.38 and 9.22-22.19; histamine 1.54-4.0 and 1.88-11.71. MeCHO and histidine levels are much higher than those normally found in musts and wines.
CA, V. 83, 1975: 41643u

COWAP, J.C.; GEAKE, F.H.
The analytical characteristics of coconut toddy. Analyst 1932, 57, 627-8.

In the manuf. of coconut toddy, the sap is drawn from an unopened flower spathe of the coconut palm and collected in an earthenwere vessel. At present a minimum of 14% of original total solids and an acidity calcd. as AcOH of less than 0.6% is required. It is suggested

that the av. percentage of total solids should be 17% and that no single sample should fall below 16%. Sampling should be taken immediately after delivery of preserved by adding $CuSO_4$. Twenty drops of satd. soln. of $CuSO_4$ will preserve 300 cc. of toddy for 6 month.
CA, V. 27, 1933: 160

DAUCHI, M.
Food seasonings with a vinegar taste. (Nakano Vinegar Co., Ltd.) Japan. 71 19,600 (Cl. C 12j), 01 Jun 1971, Appl. 65 131, 31 Dec 1964; 2 pp.

Fermented vinegars (4-10% HOAc) were neutralized with NaOH, KOH, Na_2CO_3, K_2CO_3, $CaCO_3$, $MgCO_3$, and (or) $NaHCO_3$ and dehydrated to give the powd. seasonings useful for instant dry foods.
CA, V. 77, 1972: 112705e

FAGON, M.
The volatile acids of vinegar. Bull. Pahrm. Sud-Est 1936, 40, 535-7.

Five cc. of the vinegar is placed in the app. of Parnas and Wagner and 200 cc. of the distillate titrated with 0.05 NaOH against phenolphthalein. Nonvolatile acids are detd. by substraction of this value from that obtained in the direct titration of the total acids. Addns. of HCl (7 g./l), H_2SO_4 (11 g./l), H_3PO_4 (10 g./l), and HNO_3 (12 g./l) were not carried over even mechanically into the distillate.
CA, V. 33, 1939: 1871

FURUKAWA, S.; TAKENAKA, N.; et al.
Nonvolatile organic acids in vinegar. V. Conversion of acetic acid to nonvolatile organic acids in acetic acid fermentation. (Akashi Tech. Coll., Akashi, Japan). Hakko Kogaku Zasshi 1973, 51(5), 321-6(Japan).

The conversion of HOAc to nonvolatile org. acids during the HOAc fermn. of cider supplemented with acetic-^{14}C acid was examd. Strains A-1 and A-4 of Acetobacter aceti were used. Sampling for the estn. of various components was carried out at the stage indicating a max. acidity and after a prolonged period of fermn. without the presence of EtOH. The degree of HOAc oxidn. in the culture of strain A-1 was higher than that in strain A-4; however, there was a little difference in the decrease of the total amt. of nonvolatile org. acids between the cultures of both strains. Its decrease in the culture without EtOH was greater than in the culture with EtOH. The changes in the amt. of each org. acid were approx. similar to those in the shake culture of A. rancens. The radioactivity of acetic-^{14}C acid decreased considerably even in the culture with EtOH. A portion of the radioactivity was incorporated into the cells and succinic acid, and a large portion escaped as gas. Although the succinic acid content in the culture filtrate with both strains showed a little change during fermn., its sp. activity at the final stage was more than half that of HOAc. These results indicate that succinic acid in the medium was metabolized to a considerable extent and that approx. the same amt. of succinic acid was formed from HOAc.
CA, V. 79, 1973: 41027p

FURUKAWA, S.; TAKENAKA, N.; et al.
Nonvolatile organic acids in vinegar. VI. Conversion of nonvolatile

organic acids to acetic acid in acetic acid fermentation. (Akashi Tech. Coll., Akashi, Japan). Hakko Kogaku Zasshi 1973, 51(5), 327-34 (Japan).

For elucidating the possibility of the conversion of succinic or citric acid to HOAc during HOAc fermn., a shake culture of strain A-4 Acetobacter aceti was carried out with apple juice and orange juice media (alc. fermn. liq. of each juice) supplemented with succinic-^{14}C and citric-^{14}C acids, resp. The changes in the cell growth, acidity, HOAc content, and total amt. of nonvolatile org. acids in the culture of the orange juice medium were considerably different from those in the apple juice medium. A marked growth in the orange juice medium was found even in the culture without EtOH; at the final stage the cell growth was about 5-fold that in the apple juice medium. The acidity and HOAc content at the final stage were lower than those at the first stage. Also, in the orange juice medium a pronounced decrease in the total amt. of nonvolatile org. acids, except citric acid, was found during a prolonged period of fermn. without the presence of EtOH. In the cultures of both media, the decreases in citric acid content and in its radioactivity were small, and no radioactivity was found in the cells and acid. No citric acid in the medium was involved in the oxidn. of HOAc. A decrease in the radioactivity of succinic-^{14}C acid was found throughout all the fermn. period; it was esp. marked in the orange juice medium. A portion of radioactivity lost was incorporated into the cells and HOAc and a large portion escaped as gas from the broth. The results suggest that HOAc was oxidized via succinic acid.
CA, V. 79, 1973: 41028q

FURUKAWA, S.; TAKEUCHI, T.; et al.
Nonvolatile organic acids in vinegar. II. Alcohol fermentation in cider vinegar production. (Akashi Tech. Coll., Akashi, Japan). Hakko Kogaku Zasshi 1967, 45(3), 204-10 (Japan).

During the fermentation of the sterilized juice, relatively large increases in succinic and malic acids were observed, whereas only a slight increase in lactic acid was observed. With unsterilized juice the increase in lactic acid as well as decrease in malic acid was significant in the later half of the fermentation period. The degree of change varied markedly with the kind of apple juice and the conditions used for the fermentation. These changes were brought about by the action of homofermentative lactic acid bacteria, as similar changes called malo-lactic acid fermentation are well known in wine production. Apple juice contaminated (probably with heterofermentative lactic acid bacteria) in storage contained considerable amts. of lactic and acetic acids. Alc. fermentation was markedly depressed with this juice. In acetic acid fermentation, the residual alc. content in mash obtained from sound juice was 0.32% at 42 days after inoculation, while in mash obtained from the contaminated juice it was 1.12% even at 72 days. A large decrease in lactic acid was observed in both mashes, whereas small changes in other org. acids were observed. The lactic acid probably produced by lactic acid bacteria decreased during alc. fermentation as did the nonvolatile org. acid content during HOAc fermentation. Alc. fermentation for cider vinegar production,therefore, should be carried out only with pure culture yeast.
CA, V. 69, 1968: 1921n

FURUKAWA, S.; UEDA, R.
Nonvolatile organic acids in vinegar. I. Contents of nonvolatile organic acids in commercial vinegars. (Joshigakuen High School, Osaka, Japan). Hakko Kogaku Zasshi 1963, 41, 14-19.

Com. vinegars contained fumaric, α-ketoglutaric, lactic, succinic, pyroglutamic, glycolic, malic, citric, tartaric, and 4 unidentified acids. Rice vinegars contained esp. large amts. of lactic and succinic acids, cider vinegar malic acid, wine vinegar tartaric, citric, and malic, and malt vinegar lactic and malic acids.
CA, V. 62, 1965: 15352c

GARCIA, O.; ROSARIO, C.; et al.
Vinegars. II. Content of diacetyl, acetoin, butylene glycol, and alcohol. An. Bromatol. 1973, 25(2), 121-45 (Span).

Twenty samples from different brands of wine vinegars were examd. Thirteen contained no diacetyl, 4,0.92-1.28, and 3,5.57, 11.03, and 53.00 mg/l. In 18 samples acetoin varied from 10 to 479,2 contained 744 and 1035 mg/l., and 75% had between 178 and 479 mg/l. Butylene glycol was in 70% between 158 and 561 mg/l. Two high values were 825 and 851,2 low, 55 and 59 mg/l. Alc. was 0.10-0.60 mg/l. in 65% and between 0.03 and 0.10 mg/l. in 25%; 2 contained 0.96 and 1.25 mg/l.
CA, V. 80, 1974: 106966m

GARINO-CANINA, E.
2,3-Butylene glycol and acetylmethylcarbinol in wine and vinegar. Deut. Essigind. 1933, 37, 316-17.

See C.A. 27, 3285.
CA, V. 28, 1934: 2120^7

HAESELER, G.
The determination of acid in vinegar essences and acetic acids. Branntweinwirt. 1948, 2, 243-6.

After a definition of terms (distinction among vinegar, vinegar essence, acetic acid solns., etc) data are given on the use of the titrimetric and aerometric methods for the detn. of AcOH in these liquids. The use of automatic AcOH-titrating app. in the fermentation industry is discussed.
CA, V. 46, 1952: 8323d

HENRY, A.M.
Report on (the analysis of) vinegar. J. Assoc. Official Agr. Chem. 1932, 15, 535-7; cf. C.A. 26,798.

A comparison of the use of diphenylamine (4 drops of 1% soln. in H_2SO_4) as inside indicator and of $K_3Fe(CN)_6$ as outside indicator in the $K_2Cr_2O_7$ titration of glycerol showed that practically identical results were obtained, particularly where 20 cc, of retarder (150 sirupy H_3PO_4 + 600 cc. H_2O + 250 cc. concd. H_2SO_4) is added. Laudig's findings (C.A. 22,135) were confirmed; if the total solids as detd. by the official A.O.A. method are less than 2 g. per 100 cc, the addnl. evapns, reduce the solids very little, while with higher solids the

addnl. evapn, reduces the solids materially, and the results check more closely.
CA, V. 27, 1933: 160

HENRY, A.M.
Report on (the analysis of) vinegar. J. Assoc. Official Agr. Chem. 1933, 16, 536-40; cf. C.A. 27,160.

Collaborative test confirmed that the use of $NHPh_2$ as inside indicator in the detn. of glycerol gives as accurate results as $K_3Fe(CN)_6$ as outside indicator, but is quicker and more convenient. In the detn. of ash, the tendency to cake or form dense carbonaceous residues is effectively prevented by addn. of 2 g. sucrose. The highest ashing temp. which can be safely used without altering the ratio of H_2O-insol. to H_2O-sol. P_2O_5 is 550°, while it is practically impossible to obtain proper ashing at or below 500°.
CA, V. 28, 1934: 251^7

HENRY, A.M.
Report on vinegars. J. Assoc. Official Agr. Chem. 1934, 17, 360-4; cf. C.A. $28,251^7$.

Since further collaborative work has confirmed that, in the detn. of glycerol, the use of Ph_2NH as inside indicator gives as accurate results as $K_3Fe(CN)_6$ as outside indicator, adoption of this modification as official is recommended. A study of the detn. of total solids confirmed Laudig's findings (A.C. 22,135).
AC, V. 28, 1934: 6495^4

HIRSCH, P.; DELP, O.
Step titration of wine vinegar. Determination of non-volatile acids. Z. Untersuch. Lebensm. 1931, 62, 589-93; cf. C.A. 24, 4873.

Wine vinegar differs from spirit vinegar in that it contains non-volatile acids (tartaric, malic, succinic and lactic) which can be estd. by step titration from 50 cc. of the sample treated with 2 cc. of 25% HCl remove AcOH by steam distn., dil. the residue to 100 cc., and use 50 cc. of the soln. for titration, the other 50 cc. portion serving to compensate the original color, since filtration with charcoal partially adsorbs the acids. Titrate in a colorimeter with standard NaOH to pH 8.3 (phenolphthalein) and then to pH 2,0 (buffer soln. accrording to Sorensen, thymöl-blue indicator) with 0.25 N HCl (t cc.). Keep, at the end of titration by addn. of buffer soln. and water, resp., in all solns., the same concn. of the indicator (0.6 cc). Det. the free acid (s) by adding to 50 cc. of water the same amt. of standard NaOH as above, followed by titration with 0.25 N HCl to pH 8.3 (phenolphthalein), and finally to pH 2.0 (s cc.). The sum of non-volatile acids is then r = t - s. Analysis of pure samples gave the following results (in cc. of 0.25 N HCl per 100 cc. of vinegar): pure wine vinegars 22.0-27.2, double (50% mash) 16.4, ordinary (20% mash) 4.6-5.9, spirit vinegars 0-0.2 com. essence vinegars 0.02, mixt. of wine vinegar and spirit vinegar (1 + 4) 4.75, com. wine vinegars 0.7-5.6. The low values of some in the last group indicate adulteration.
CA, V. 26, 1932: 3867

ILLING, E.T.; WHITTLE, E.G.
Analysis of vinegar. A modified method. Analyst 1939, 64, 329-31.

The method of Edwards and Nanji (C.A. 32, 6393) is modified so that only one distn. is required and only 60 ml. of sample. The oxidation value, I_2 value and ester value as obtained by the new procedure all agreed fairly well with the result obtained by the original method.
CA, V. 33, 1939: 5588

JONES, D.D.; GREENSHIELDS, R.N.
Volatile constituents of vinegar. III. Formation and origin of volatiles in laboratory acetifications. (Dep. Biol. Sci., Univ. Aston, Gosta Green/Birmingham, Engl.). J. Inst. Brew., London 1970, 76(3), 235-42 (Eng).

A study was conducted of the volatile constituents produced during the manuf. of com. malt vinegar on a lab. scale. Formation and changes of these substances in surface culture, aerated, and submerged fermentations were in general similar to those obsd. in the com. process. Losses were noted when higher temp. and submerged fermentation methods were used. Propionic acid and acetoin decreased when max. aeration was employed. Oxidns. of n-propyl, isobutyl, sec-butyl, n-amyl, and isoamyl alc. relative to EtOH were compared to those found by Tanaka (1938). The metabolic pathways for the origin of the volatiles were considered.
CA, V. 74, 1971: 52124r

JONES, D.D.; GREENSHIELDS, R.N.
Volatile constituents of vinegar. IV. Formation of volatiles in the Frings process and a continuous process of malt vinegar manufacture. (Dep. Biol. Sci., Univ. Aston, Gosta Green/Birmingham, Engl.). J. Inst. Brew., London 1971, 77(2), 160-3 (Eng).

Gas-liq. chromatog. was used to fractionate and measure volatiles formed during the Frings process and during a continuous process of malt vinegar manuf. AcH, EtOH, isoamyl alc., AcOH, PrOH, sec-BuOH, iso-BuOH, amyl alc., and also sec-BuOAc, iso-BuOAc and amyl acetate were detected during the alc. fermentation but propionic acid, isobutyric acid and acetoin were produced during acetification. The increase in the no. and concn. of the volatiles of these processes was compared with those found for the Quick method. Details of these comparisons were given.
CA, V. 75, 1971: 34050e

KAHN, J.H.; NICKOL, G.B.; et al.
Identification of volatile components in vinegars by gas chromatography-mass spectrometry. (U.S. Ind. Chem. Co. Div., Natl. Distill. and Chem. Corp., Cincinnati, Ohio). J. Agr. Food Chem. 1972, 20(2), 214-18 (Eng).

Sixty-one compds., many not previously reported, were identified in 6 different concns. prepd. by neutralizing vinegars with Mg oxide and extg. with ether-pentane. The compds. include 16 esters, 11 alcs., 11 halogenated compds., 8 hydrocarbons, 7 carbonyls, and 5 ethers and acetals. Chromatograms are presented of exts. of distd. and cider vinegars produced by the trickling and submerged culture processes,

resp. Few differences in volatile compds. were found between products of the 2 manufacturing processes, but large differences were noted between cider, distd., malt, and wine vinegars.
CA, V. 76, 1972: 111830j

KINTNER, T.C.; MANGEL, M.
Variation in hydrogen-ion concentration and total acidity in vinegar. (Univ. of Missouri, Columbia). Food Research 1952, 17, 456-9.

The mean pH of 49 samples of 7 different types of vinegar was 3.05; with a range of 2.55-3.50. The percentage of AcOH ranged from 3.5 to 5.6 with a meant of 4.7%.
CA, V. 46, 1952: 11497d

KOSTAL, J.
Aromatization of fermentation vinegar. Kvasny Prum. 1972, 18(1), 226-7 (Czech).

Various plants (e.g., estragon, dill, thyme, peppermint, parsley, onion, and garlic) after 3-fold macerating (4-fold with dried plants) could be successfully used in the title aromatization.
CA, V. 78, 1973: 96254v

KREIPE, H.
How explain the variations in the estimation of acid in vinegar? Deut. Essigind. 1936, 40, 193-5.

The fundamental principles of volumetric analysis are discussed in connection with possible errors inherent in titrating the acid of vinegar. Errors due to wet barrels or casks are likewise considered.
CA, V. 30, 1936: 6126^8

KREIPE, H.
Importance of water spraying in the recovery of alcohol and acetic acid from vinegar fermentation. Deut. Essigind. 1936, 40, 305-6; 313-15; cf. C.A. 30,6126^8

The use of H_2O (regarded as a solvent rather than as a cooling agent) resulted in recovery of 38 and 55% of AcOH and EtOH instead of 22 and 8%.
CA, V. 33, 1939: 6519

KRIZENECKY, J.; NEVALONNYJ, M.
The vitamin value of fermentation and artificial vinegars. Z. Untersuch. Lebensm. 1933, 66, 278-88.

Two wine vinegars and 1 artificial vinegar prepd. from glacial acetic acid were investigated. The fermentation vinegars contained the antineuritic B vitamin and the water-sol. growth-promoting G. Vitamin C was not present in any significant amt. These vitamins were absent in the artificial vinegar. The AcOH of the artificial vinegar had a much more poisonous action than that from the fermentation vinegar.
CA, V. 28, 1934: 1384^5

LLAGUNO, C.
Study of vinegar by gas chromatography. (Inst. Ferment. Ind., Madrid,

Spain). Sem. Vitivinic. 1972, 27(1.367-1.368), 4309, 4311, 4313 (Spain).

The following compds. were isolated by gas chromatog. from Spanish wine vinegars: MeOH, EtOH, PrOH, BuOH, iso-BuOH, 2-methylpropanol, isoamyl alc., Et formate, Et acetate, Me acetate, Et propionate, Et butyrate, AcH, and acetoin. Acetoin content increases with acetification and a low concn. raises the suspicion of adulteration with synthetic acetic acid which is free from acetoin.
CA, V. 78, 1973: 96153m

LOUGHREY, J.H.C.
Report on vinegar. J. Assoc. Offic. Agr. Chemists 1949, 32, 336-40; cf. C.A. 42, 9068d.

A comparative study on vinegar of the A.O.A.C. tentative method for the detn. of caramel in vinegar with Mather's test (I) and the A.O.A.C. confirmatory test for caramel in wines (II) showed that I and II appeared to be more reliable. The use of 2,4-dinitrophenylhydrazone in I as a reagent to confirm the presence of caramel after it copptn. with pectin seemed to be superior to the phynylhydrazone-HCl now used. In II only about 15% of the total amt. of caramel present was pptd. by the Zn $(OH)_2$, the figura being quite const. A collaborative test of the permanganate oxidation method indicated it is of value only in differentiating between true vinegars and dil. AcOH. The present method for tartaric acid (III) and tartrates in vinegars is likely to give erroneous results because of the difficulty encountered in driving off all of the AcOH present. Application to vinegar of the A.O.A.C. bitartrate method for III in fruit appeared to be less subject to error and further study of the test was recommended.
CA, V. 43, 1949: 7187i

MAEKAWA, K.; KODAMA, M.
Isolation and identification of phenolic acids in rice vinegar. (Ehime Univ., Matsuyama, Japan). Agr. Biol. Chem. (Tokyo) 1964, 28(7), 436-42.

Ether-sol. compds. of rice vinegar were identified by chromatography using a cellulose column and Amberlite XE-64. Compds. detected were p-hydroxyphenylacetic acid, p-hydroxyphenyllactic acid, p-hydroxybenzoic acid, and phenyllactic acid.
CA, V. 61, 1964: 16738e

MALCHER, J.
Distinctive characteristics of some vinegar. Mitt. Lebensm. Hyg. 1949, 40, 161-4.

The detn. of fusel oil in the finished vinegar by Komarowski-Fellenberg's color reaction, with salicylaldehyde and H_2SO_4, was described and the analysis of 24 vinegar samples given in a table. The amt. of higher alcs. or esters of higher alcs. in finished vinegar can be considered as a distinct characteristic of different types of vinegar.
CA, V. 44, 1950: 729a

MASUDA, Y.; SHIOKAWA, H.
Experiment file. 3. Gravimetric titrimetry of acetic acid in vinegar. (Nippon Women's Univ., Tokyo, Japan). Kagaku No Jikken 1971, 22(3), 239-41 (Japan).

A high school expt. for the gravimetric titrn. of acetic acid in vinegar is presented which uses NaOH and phenolphthalein.
CA, V. 76, 1972: 33345p

MECCA, F.
Chemical differentiation of grape wines and vinegars from other fermented fruit juices. (Univ. Milan). Chim. e ind. (Milan) 1956, 38, 1020-3; cf. C.A. 29, 7575.

Grape juices and their derivs. have a lower content of nonfermentable sugars (i) than ciders from pears, apples, figs, dates, etc. To det. the nature of a juice sample, the fermentable sugars are eliminated by fermentation with yeast and the acids pptd. with basic Ba acetate. Then, the I are pptd. as complexes of $CuSO_4$ and $Ca(OH)_2$ and titrated with HIO_4. The results are expressed in mg. $C_6H_{12}O_6$/1. (periodic index). The following values were obtained: grape wines, 1100-1500; grape vinegars, 400-510; fruit ciders, 2340-4850; fruit vinegars, 2500-4600. Thus, adulteration of wines can be easily detected.
CA, V. 51, 1957: 5357d

MICHAEL, G.A.
Vinegar analysis. (Massachusetts Dept. of Public Health, Boston). Assoc. Food and Drug Officials U.S., Quart. Bull. 1949, 13, 93-100.

The vat, the older type generator, and the Frings method, which were described, produce vinegars having, resp., high solids, and low acid, slightly lower solids and slightly higher acid, and lower solids and higher acid. Five samples of Frings process vinegar (at charge) contained 0.63-0.68% AcOH, 1.79-1.84% solids, from a theoretical yield of 7.18-7.77%; and (at out) contained 6.28-7.17% AcOH, 1.60-1.64% solids, and had a permanganate no. of 2.26-4.45, with a yield of 6.28-7.17%, and an efficiency of 86.4-92.3%. These findings may necessitate a modification of stance on a 1.60% total solids for all cider vinegar, regardless of percentage AcOH, to a stance of 1.60% total solids for full-strength cider vinegar. The permanganate no. of a series of samples of AcOH and vinegars ranged from 0.0 to 15+, their distillates 0.1-6.2, and their undistd. residues 0.0-15+. Of 75 samples of cider vinegar the av. permanganate no. of 61 was 5.08 and of 14 was 2.02, while 15 samples of white vinegar were equally divided between the high and low values. Permanganate nos. of com. vinegars increased after the use of this criterion became known. Decolorization of vinegar by C did not effect the permanganate no.
CA, V. 44, 1950: 5524d

MORGAN, R.H.; VOELCKER, E.
Factors affecting the chemical contents of amlt vinegar. Food Process. Packaging 1963, 32, 207-11.

Results are reported on vinegars made by improved methods of fermentation and acetification. Improved yeast fermentation results in less lactic acid in the gyle. Temps. which give best yield of AcOH during

acetification also factor destruction of lactic acid rather than its conversion to AcMeCHOH (I). The combined result is higher yield of AcOH and less I. Low I results in low values for oxidn., iodine, alk. oxidn. and ester nos. High residual alc. itself represents loss of yield pushing up oxidn. and ester nos.
CA, V. 59, 1963: 5732b

NAGARATHNAMMA, M.; SIDDAPPA, G.S.
Analysis and detection of adulteration in vinegar. Indian Food Packer 1964, 18(2), 8-10. 77 references.
CA, V. 61, 1964: 12545d

NAGARATHNAMMA, M.; PRUTHI, J.S.; et al.
Variations in the physicochemical characteristics of commercial vinegars (Brewed and synthetic) manufactured in India. (Central Food Technol. Res. Inst., Mysore). Indian Food Packer 1964, 18(2), 15-9.

The physicochem, consts, for 92 vinegars from different parts of India are presented. The differences between natural and artifical vinegar were apparent in the dets. for total solids, ash, N, P_2O_5, oxidn. value, ester value, I value, fixed acidity, and volatile reducing substances.
CA, V. 61, 1964: 12553g

NAKAYAMA, S.; SHIOTA, O.; et al.
Denatured alcohol with flavor for vinegar brewing. (Kagawa Prefect. Ferment. Food Exp. Stn., Uchinomi, Japan). Kagawa-Ken Hakko Shokuhin Shikenjo Hokoku 1972, (64), 32-8 (Japan).

When EtOH denatured with 0.1 kg vinegar flavor contg. orange oil 2, oil 6, lemon oil 2, citral 2, and lime oil 0.2 parts in 20 l. EtOH was mixed with vinegar 220, sake starter as nutrients for bacteria 40, and water 260 l., and was fermented by stationary method with cultured bacteria film of Bacterium aceti for a month at 27-30°, fermn. proceeded normally and pH decreased from 2.9 to 2.4. Characteristic odor of the flavor disappeared 10 days after fermn. and no difference was obsd. by gas chromatogram of head space vapor between the vinegar made by this new method and the control.
CA, V. 80, 1974: 35966y

NANBA, T.
Sugar analysis of vinegar and white soy sauce by liquid chromatography. (Food Res. Inst., Japan). Aichi-Ken Shokuhin Kogyo Shikensho Nempo 1972, 13, 52-7 (Japan).

Sugar contents were detd. in vinegar, white soy sauce, and Tamari soy sauce by liq. chromatog. The std. curves were linear with increasing sugar concns. as measured by peak heights or areas. Glucose [50-99-7] were the major sugars in com. vinegars, and the contents varied from products to products. White soy sauce contained >70% of total sugars as glucose, whereas Tamari soy sauce contained mainly maltose [69-79-4] and glucose.
CA, V. 84, 1976: 29277r

OGATA, M.

Diacetyl in seasonings. (Ind. Res. Inst. Fukuoka, Japan). Nippon Jozo Kyokai Zasshi 1970, 65(9), 815-6 (Japan).

Diacetyl in vinegar, soy sauce, and miso was detd. by the Voges-Proskauer method. Diacetyl was 0-20 mg/100 ml (generally <10 mg/100 ml) in vinegars. The content of diacetyl was <10 mg/100 g in miso. It was 0-4.0 mg/100 g in plain unmatured miso, while red, matured miso contained as much as 6-9 mg/100 g. Unpasteurized soy sauce, brewed for 6 months, contained as much as 8 mg diacetyl/100 ml.
CA, V. 75, 1971: 150459u

PONTIN, I.A.

Determination of acetone in vinegars from alcohol. Anales direc. nacl. quim. (Buenos Aires) 1953, 6(12), 83-6.

The reaction of salicylaldehyde in alk. soln. with small quantities of acetone is specific and very sensitive. Traces of acetone in vinegars were estd. by using the Klett-Summerson photocolorimeter. Several curves and tables are given.
CA, V. 49, 1955: 4931h

PRITZKER, J.

The differentiation of wine vinegar from other types of vinegar. Mitt. Lebensm. Hyg. 1934, 25, 101-6.

The microchem. method of Patsauer (C.A. 27, 5885) recommended for the identification of tartaric acid and the differentiation of wine vinegars from those from other sources was investigated and found to be inadequate. The method of Pratolongo (C.A. 27, 1981) suggested for the same purpose and depending on "I nos." and oxidizability with 0.1 N $KMnO_4$ was likewise found to be unsatisfactory. The detection and detn. of acetylmethylcarbinol serve a better purpose. The amt. of acetylmethylcarbinol found varies from 49 to 122 mg. per 1. Detailed analytical results are given of some of the wine vinegars of commerce, with special reference to their glycerol content. In the detn. of alc. in vinegars, the acetylmethylcarbinol goes over quantitatively into the distillate. The later can be detd. in the distillate by the method of Arbenz by using Fehling soln. in the cold and multiplying the Cu_2O obtained by 0.25. Biacetyl could not be found in any of the samples. In authentic and properly fermented spirit vinegars, no acetylmethylcarbinol could be found.
CA, V. 28, 1934: 4533^6

PROVVEDI, F.

The identification of the adulterations of vinegar. Ind. ital. conserve aliment. 1934, 9, 187-9.

By means of chem. analysis it is not possible to detect the presence of AcOH in true vinegar if the addn. of the acid is less than 5%.
CA, V. 28, 1934: 6519^7

PRUTHI, J.S.; NAGARATHNAMMA, M.; et al.

Detection of adulteration in vinegar by application of V.R.S. Technique and paper chromatography. (Central Food Technol. Res. Inst., Mysore). Indian Food Packer 1964, 18(2), 11-4.

The V.R.S.(volatile reducing substances) detd. by redn. of $KMnO_4$ have a higher concn. in natural vinegars than in synthetics, due to traces of acetic, malic, and lactic acids, alcs., aldehydes, and furfural. The differences in the paper chromatograms of vinegar and oxalic, succinic, tartaric, citric, and malic acids are demonstrated.
CA, V. 61, 1964: 12553f

PRZYBYLSKI, E.; PARYS, J.
Determination of acidity of some food products. Roczniki Panstwowego Zakladu Hig. 1955, 6, 119-40 (English summary).

A potentiometric titration with NaOH has been used to det. the total acidity and mineral acids in vinegar, wine, beer, flour, and coffee substitutes. Small amts. of mineral acids were titrated after adding a known quantity of the acid to the sample.
CA, V. 50, 1956: 1223c

RICHARD, C.
Application of the chromate method to the determination of alcohol in vinegars and some alimentary products with low alcohol content. (Inst. Pasteur, Saigon, China). Ann. fals. et fraudes 1957, 50, 8-15.

From 200 cc. vinegar neutralized against phenolphthalein with NaOH, 20 cc. is distd. Ten cc. of a soln. of 4.9 g. $K_2Cr_2O_7$ in HNO_3 (d. 1.38) to make 1000 cc. dild. with 10 cc. H_2O and an aliquot of the distillate is added. During 30 min. the color must not change to green-blue; otherwise a smaller aliquot must be used. The soln. is dild. with 300 cc. H_2O contg. 1 g. KI and titrated with 0.1 N $Na_2S_2O_3$. The titer of the $K_2Cr_2O_7$ soln. is detd. separately. Each 0.1 N soln. corresponds to 1.15 mg. alc. Natural French vinegar contained 8.9 and 2.3 g. EtOH/l.; artificial vinegar was free of EtOH. Vinegar from Vietnam and China contained 1-3.95 mg. Soybean cheese contained 1% alc. The method was also used to follow the EtOH content of fermenting sugar cane and coconut juices.
CA, V. 51, 1957: 9081e

RICHARD, C.; PLAGNOL, H.
Differentiation of vinegars from Viet-Nam. Artificial vinegar, Vietnamien and imported vinegars from alcohol, and wine vinegars. (Inst. Pasteur, Saigon, France). Inds. aliment. et agr. (Paris) 1956, 11, 787-8.

Analytical data are reported for artificial vinegar, Vietnamien vinegar, imported alc. vinegar, and vinegar produced from red wine. Total acidity, fixed acidity, pH, dry ext., K content, $KMnO_4$ index, residual alc., and acetone content are tabulated for each of the vinegars described. The data are not analyzed or evaluated.
CA, V. 51, 1957: 5355a

ROKITANSKY, K.; FORAMITTI, A.; et al.
Theory and practice of alcohol determination. I. II. (Lab. Ver. Mautner-Markhof'sche Presshefefabriken, Vienna). Mitt. Versuchssta. Gärungsgewerbe 1954, 8, 160-85.

A method is given for detg. the amt. of liquid to be distd. off from a given amt. of EtOH-contg. liquid, either sugar-free or contg. sugar, to obtain a predetd. EtOH content in the distn. residue, either in percentage by vol. or by wt. The method is applied to examples from the vinegar, brewery, and liqueur industries. The distn. must be conducted without dephlegmation. A special app. is described and illustrated in which the total heating space is surrounded by the heating liquid (H_2O-glycerol mixt.), therefore the vapors cannot condense before entering the condenser. When using ordinary distn. vessels, it is necessary to distil rather quickly. Residual EtOH was detd. by the Widmark method.

III. Mitt. Versuchssta. Garungsgewerbe 1955, 9, 23-30.

The calcn. is explained in detail.
CA, V. 49, 1955: 7803a

SMITH, R.A.; WOODS, J.A.F.
Vinegar-type flavor composition. U.S. 3,630,756 (Cl. 99/140R; A 23 1), 28 Dec 1971, Appl. 20,840, 18 Mar 1970; 4 pp.

A solid flavor compn. of vinegar-type is provided by absorbing a compn. comprising a nontoxid water-insol. substrate still residue resulting from the distn. of vinegar from a double fermentation vinegar liquor (hitherto of no com. value) in a nontoxic substantially water-insol. substrate, preferably amorphous silica gel. Thus, a malt vinegar contg. 4-7.5% acid was distd. to an acidity of 14% and solids content of 36%. To 20 parts residue was added 5 parts amorphous silica gel and 3 parts NaAl silicate. The mixt. was ground and the granules gave an authentic vinegar flavor which could be used in tomato or Worcestershire sauces, etc.
CA, V. 76, 1972: 125620c

SUOMALAINEN, H.; KANGASPERKO, J.
Aroma substances of vinegar fermentation. (Forschungslab, Staatlichen Alkolnonpol (Alko), Helsinki). Z. Lebensm. Untersuch. Forsch. 1963, 120(5), 353-6.

Vinegars developed from fermentation of wine and spirits (alc.) are compared with respect to development of esters (calcd. as EtOAc) and to the amts. of individual esters as dect. by gas-chromatographic analyses. The product from alc. contained only EtOAc in the ester fraction,whereas wine vinegar and another fruit vinegars contained acetoin, iso-AmOH, AmOH, iso-BuOH, EtOAc, iso-BuOAc, and diacetyl. Only about up to 200 mg./l. of EtOAc was developed in alc. vinegar during fermentation; the principle amt. of esters in com, vinegars, up to 1500 mg./l. developed during storage.
CA, V. 59, 1963: 15922d

TAKEUCHI, T.; FURUKAWA, S.; et al.
Nonvolatile organic acids in vinegar. III. Changes in amount of nonvolatile organic acids during fermentation and storage of cider vinegar. (Marukan-su Co. Ltd., Kobe, Japan). Hakko Kogaku Zasshi 1968, 46(4), 288-92 (Japan).

Changes in the amt. of non-volatile organic acids during cider vinegar fermentation, by both surface and submerged cultures, and during the storing (aging) period of mash obtained by the surface culture on an industrial scale were detd. by partition chromatog. on silica gel. The acetic acid production rate and decreases in succinic acid and malic acid contents in the submerged culture were much larger than those in the culture. Larger decreases in both acid contents were observed in the latter half of the fermentation period, especially in the last stage, indicating a residual alc. level <0.3%. On the other hand, a decrease in lactic acid content was observed throughout the fermentation period in both cultures, particularly evident in early fermentation. During the storage of mash titrable acidity increased in lactic acid and succinic acid contents were observed, and the patterns of their changes were approx. similar to those in the surface culture. The relation between the changes in the amt. of non-volatile organic acids and the quality of vinegar, as well as the role of acetic acid bacteria during the mash storage, were discussed.
CA, V. 69, 1968: 50974r

TAKEUCHI, T.; FURUKAWA, S.; et al.
Nonvolatile organic acids in vinegar. IV. Conditions affecting changes in the amount of nonvolatile organic acids during acetic acid fermentation and storage of mash. (Marukan-su Co. Ltd., Kobe, Japan). Hakko Kogaku Zasshi 1968, 46(4), 293-8 (Japan).

The effect of different types of strains and cultural conditions on the changes in the amt. of non-volatile organic acids during the acetic acid fermentation and the storage of culture media obtained by a surface culture was examd. Cider supplemented with lactic acid and ammonium phosphate was used as a medium. Oxygen absorption rates in surface and shake cultures were 0.056 and 0.325 mM O_2/l./min., resp. Both R and S strains belonging to Acetobacter rancens were used as test microorganisms. These S and R strain cultures showed similar changes in the amt. of nonvolatile organic acids until their acidity reached a max. Thereafter, however, the acidity decreased and malic acid increased in the R strain culture, while in the S strain culture malic acid decreased. Each organic acid showed characteristic changes in each phase of fermentation. Changes in the amt. of organic acids in each phase of the surface and shake cultures were similar to those in the submerged culture on an industrial scale, except for a great increase in malic acid content during a prolonged period of fermentation, without the presence of residual alc. Changes in the amt. of non-volatile organic acids in the shake culture were larger than those in the surface culture. On the other hand, the surface culture in this expt. showed larger changes in organic acid contents than the culture conducted on an industrial scale. These results suggested that changes in the amt. of nonvolatile organic acids during fermentation are mostly influenced by the degree of O supply under given conditions. The max. ratio of the increased acetic acid content to the consumed EtOH was ∼113% throughout this expt., and in this case the ratio of the increased acidity to the consumed EtOH was ∼92%. When acidity decreased in the fermentation with the R strain, an increase in malic acid and a decrease in acetic acid were observed.
CA, V. 69, 1968: 50973q

TILLE, O.
Aromatic vinegars. Deut. Essigind. 1933, 37, 273.

Directions are outlined for the prepn. of aromatic vinegars, notably those of the tarragon and walnut types.
CA, V. 28, 1934: 2120^4

WLATER, E.
Chemistry and physics in the manufacture of vinegar. Deutsche Essigind. 1925, 29, 383-4, 395-8.
CA, V. 20, 1926: 3059

YAMAGUCHI, G.; MASAI, H.
Flavor components of rice vinegar. III. Sunstruck flavor of rice vinegar. (Nakano Biol. Chem. Inst., Nakano Vinegar Co., Ltd., Nakano, Japan). Agric. Biol. Chem. 1975, 39(10), 1903-5 (Eng).

The precursor of the title sunstruck flavor was formed in the course of maturating sake cake. A large quantity of yeasts in the sake cake was autolyzed and photochem. sensitization substance was evolved. Like the sunstruck flavor of milk reported by Patton et al. it is thought that, VB_2, a photochem. sensitization substance caused methionine to react photochem. and to evolve the sunstruck flavor 3-(methylthio)-propanal (methional). Organoleptically, vinegar with added methional and vinegar which had evolved the sunstruck flavor had the same odor.
CA, V. 84, 1976: 15850k

YAMAGUCHI, G.; MASAI, H.
Flavor components of rice vinegar. IV. Peroxidized flavor and acidic fraction of rice vinegar. (Nakano Biol. Chem. Inst., Nakano Vinegar Co., Ltd., Nakano, Japan). Agric. Biol. Chem. 1975, 39(10), 1907-11 (Eng).

As a potent producer of peroxidized flavor, Acetobacter No. 112 was selected out of 103 strains. This Acetobacter No. 112 was classified according to Bergey's, Frateur's, and Yamada's methods and identified as Acetobacter xylinum. The peroxidized flavor was generated only in the medium contg. HOAc. It was clarified by gas chromatog.-mass spectrometry that the compds. of peroxidized flavor were propionic acid, isobutyric acid, etc. Nonvolatile acids were analyzed by liq. chromatog. Gluconic and oxalic acids were found in greater amts. in vinegar brewed by shaking culture, malic and citric acids were predominant in peroxidized vinegar, and glycolic and lactic acids were predominant in vinegar brewed by surface culture.
CA, V. 84, 1976: 15851m

YAMAMOTO, Y.; KUMAMARU, T.; et al.
Solvent extraction of anions by metal chelate cations. 48. Colorimetric determination of salicylic acid in vinegar. (Fac. Sci., Hiroshima Univ., Hiroshima, Japan). Eisei Kagaku 1971, 17(2), 109-11 (Japan).

Salicylic acid in com. Japanese vinegar is extd. into $PhNO_2$ in the presence of tris (1,10-phenanthroline)iron(II) chelate and absorbance measured at 516 mμ
CA, V. 75, 1971: 62230g

e. Purification

IOANNIDIS, D.; BASILEIOS, A.
Detection of methanol, arising from the addition of denatured alcohol to wine, in vinegar. Praktika (Akad. Athenon) 1932, 7, 345-9.

Twenty cc. is neutralized with NaOH (phenolphthalein), and 4.5 cc. is then distd. To 0.3 cc. of the distillate are added 5 cc. of 1% aq. $KMnO_4$ and 0.2 cc. of concd. H_2SO_4. After 3 min. are added 1 cc. of 8% $H_2C_2O_4$, 1 cc. of concd. H_2SO_4 and 5 cc. of fuchsin reagent (50 cc. of 1% fuchsin soln., 33 cc. of $NaHSO_3$ soln., and 4 cc. of concd. H_2SO_4). Pure vinegar gives no coloration in 15 min.; adulterated vinegar gives a bluish violet color.
CA, V. 28, 1934: 4533^4

KRAUS, E.J.
Vinegar under quartz lamp. Deut. Essigind. 1934, 38, 140.

Vinegar from different sources shows when viewed in ultra-violet light fluorescence: a.3.5-7.5% table vinegar bright to reddish brown, 12.2% acetic spirit a light dull white, 7.5% wine vinegar a strong blue, and 10% aromatic vinegar a bluish gray coloration, the wine vinegar especially being characterized by a strong fluorescence. This varying behaviour under the quartz lamp. is pronounced in Et_2O and AmOH exts. of such vinegars. The AmOH ext. of wine vinegar is milkglass-like in color with strong fluorescence, while that of 3.4-7.5% table vinegar fluoresces faintly brownish red to very faintly grayish brown, that of acetic spirit faintly grayish brown, and of aromatic vinegar dirty gray. On the basis of this behavior it is possible to differentiate wine vinegar from that of other sources, notably in admixt. with other vinegars.
CA, V. 28, 1934: 4832^5

KREIPE, H.
Sterilization of vinegar. Deut. Essigind. 1932, 36, 336-8.

The high acid contents of vinegars, in combination with long storage, appear to be the best protection against germ invasion in finished products. Sterilization of vinegars is discussed from the standpoint of pasteurization, filtration, sulfuring and katadyn procedure.
CA, V. 27, 1933: 558

KREIPE, H.
Sterilization of spirit vinegar by the "Katadyn" process. Deutsche Essigind. 1933, 37, 57-60; cf. C.A. 27, 558.

The electro-Katadyn app. is described in connection with its manipulation. Expts show that an activation of 250 per 2. suffices to destroy all vinegar bacteria and eels, though the latter are less sentitive

to Katadyn -Ag than to the bacteria. The Katadyn treatment is without effect on the taste and smell of vinegar, although higher activation causes the vinegar to become turbid.
CA, V. 27, 1933: 2527

KREIPE, H.
Sterilization of spirit vinegar and wine vinegar by the catadyn process. Deut. Essigind. 1933, 37, 257-9; cf. C.A. 27, 2527.

Spirit vinegars activated by 250 y or more per l. are still sterile after 6 months storage and suffer no new infection. Expts. with double wine vinegar show that bacteria are killed by 850 y in 7 days, by 500 y in 18 days. Vinegar eels, on the other hand, succumb in double wine vinegar only to 850 y and upward in about 14 days. The activation of double wine vinegar must be greater, for production of like effects, than with spirit vinegar, Smell and taste of double wine vinegar are unimpaired by the catadyn process. With higher activation (from 850 y up) an opalescent turbidity develops.
CA, V. 28, 1934: 2120^2

KREIPE, H.
Treatment of sterilized vinegars. Deut. Essigind. 1933, 37, 389-91.

The stability of sterilized vinegars is discussed from the standpoint of process employed therefore, e.g. pasterurization, filtration, sulfurization, and catadyn treatment.
CA, V. 28, 1934: 2120^6

OTA, T.; NAKANO, M.; et al.
Effect of several preservatives on keeping quality of vinegar. (Food Res. Inst. Tokyo). Shokuryo Kenkyusho Kenkyu Kokoku 1964, 18, 36-9.

The effectiveness of 25 chemicals and 4 metals in preventing microbial deterioration of unpasteurized vinegar contg. 3.7% AcOH was examd Ag, 0.001% chloramphenicol, 0.0025% trimethyllaurylammonium 2,4,5 trichlorophenoxide, and 0.005% 2-methylnaphthoquinone (I) prevented deterioration for 60 days at 30°. On examn. with L-cysteine, it was revealed that the effect of Ag and I is due to their combining with microbial the SH groups. Concns. required to exhibit about the same effect as the above 4 reagents were: 0.01-0.025% dehydroacitic acid, naphhol, hexamethylenetetramine, 5-nitro-2-furaldehyde semicarbozone, 5-nitro 2-furylacrylamide, and $NaHSO_3$; and 0.05% salicylic acid and Bu -hydroxybenzoate. Sorvic acid, benzoic acid, Terramycin, streptomycin, polymtxin, Acti-Dione, penicillin, Na propionate, capric acid, and HC_2H could not prevent the growth of microbes even at 0.1%.
CA, V. 61, 1964: 13802e

SHIRAEFF, D.A.
Quantitative methods for trace amounts of poly (vinylpyrrolidinone). (Gen. Aniline & Film Corp., Easton, Pa.). J. Assoc. Office Agr.Chemists 1964, 47(4), 724-30.

Poly (vinylpyrrolidinone (PVP) used to prevent haze in beer or vinegar, and to clarify wine, can be detd. by 2 proposed methods: (A) in chromatography the spread of the spot formed by PVP when added to paper Pyromine Orange 2R is a function of the PCP concn. (β) PVP ppts. at

concns. of $HClO_4$ 1.6%. The ppt. is proportional to the PCP and is measured nephelometrically or spectrophotometrically.
CA, V. 61, 1964: 10004f

YANAGIDA, F.; SUMINOE, K.
Acetic acid bacteria and their utilizations. III. Prevention of clouding of vinegar by diethyl pyrocarbonate. (Dep. Brew., Tokyo Univ.Agric., Tokyo, Japan). Nippon Jozo Kyokai Zasshi 1972, 67(1), 61-5 (Japan).

Acetic acid bacteria were killed in vinegar by 25 ppm diethyl pyrocarbonate (DEPC). With a decrease in the acid concn. in vinegar the sterilizing effect of DEPC decreased. Practically, 100 ppm DEPC were required for complete sterilization of the clouding bacteria in the vinegar; the sterilizing effect of DEPC disappeared after some time.
CA, V. 77, 1972: 112587t

f. Storage

ALLGEIER, R.J.; WISTHOFF, R.T.; et al.
Packings for vinegar generators. (U.S. Industrial Chemicals Co., Baltimore, Md.). Ind. Eng. Chem. 1954, 46, 2023-6.

Expts. are described which demonstrate the successful use of coke, rattan, and Berl saddles for packing pilot-plant generators producing distd. vinegar. The expts. were conducted by the circulating procedure commonly employed in vinegar plants. It was shown that with proper management of nutrient addn. the 3 different types of packings compared favorably with the conventional beechwood packing. It was also indicated that nutrient requirements of the vinegar-producing organisms change with the type of packing, and periods of circulation in the exptl. generators with vinegar from an active generator were necessary to bring the coke or ceramic saddles into satisfactory vinegar production. It was explained that the study was undertaken because it may be desired to use materials other than wood for reasons of economy, or in the event that wood shavings are not available. The crit. factors which required solution and application of such packings to plantscale operations are discussed.
CA, V. 49, 1955: 2106h

BARBIERI, G.; CANALI, G.; et al.
Effect of copper content of the steel base, of the type of tin plate, and of lacquering on the behavior of containers for high-acid foods. (Staz. Sper. Ind. Conserve, Parma, Italy). Ind. Conserve (Parma) 1964, 39(3), 188-90 (Ital).

Test packs of lemon juice and vinegar in fully lacquered tin plate cans were made. The Cu content of the steel base had no effect on the corrosion resistance of the cans. The adhesion of lacquers to electrolytic tin plate was decidedly better than to nonelectrolytic tin plate. The best protection was obtained by 2 coats of lacquer.
CA, V. 64, 1966: 3839d

MATHIESEN, E.
Vinegar and its use in canning, especially of marine products. Tids. Hermetikind. 1933, 19, 319-22.

Production and uses of wine vinegar and vinegar essence are described. In canning sardines, markerel, etc., the HOAc concn. of the vinegar should not be over 2%, giving about 0.5% in the product after storage; higher strengths detract from the flavor and are more corrosive. Tests were made with herring sardines, canned with 2.0, 2.5, 2.9, 3.8, 4.2 and 4.9% strengths of vinegar and stored 2 years at 10-15°. At 2% the sardines kept well and there were no swells; above 4% all the cans were swells. For a like HOAc concn. some cans were packed in strongly salted vinegar (15% NaCl), others with only 0.3% NaCl. Corrosion was more severe in the cans with 15% NaCl.
CA, V. 28, 1934: 1114^6

SHAPTON, D.A.
Canned and bottled food products (soups, mayonnaise, sauces, and vinegar). (H.J. Heinz Co., Ltd., Hayes/Middlesex, Engl.). Qual. Contr. Food Ind. 1972, 3, 35-79 (Eng).

Edited by Herschdoerfer, S.M. Academic Press: London, Engl. A review. Specification of ingredient materials sampling inspection schemes for soups, mayonnaise, tomato ketchup, fruit sauces, and vinegar are discussed. 155 refs.
CA, V. 77, 1972: 124827j

VAILLANT, P.
Plastic in foodstuff packaging, (Elelmiszerek csomagolasa muanyagba); (Sidel Emballages Legers, Paris, France); Muanyag es Gumi 1969, 6(7), 267-70.

PVC bottles have come into common use in France during the fast few years for packaging edible oil, vinegar, wine, juice, etc., because of advantages of low weight, savings in shipping and other costs, and elimination of costs of handling returned bottles. Polyethylene bottles are preferred for milk and other dairy products. In Hungarian.
Eng. Index Annual, V. 69(I), 1970: 1258

VII FERMENTED CASSAVA

a. Method of Preparation

ACENA, B.; PUNO, G.D.

A study on the use of cassava in the beer industry. (Dept. Agr. Nat. Resources, Manila). Philippine J. Agr. 1955, 20, 1-15 (Pub. 1957).

Phys. and chem. analyses showed that the ext. yield of cassava products was comparable with the best commonly used brewing adjuncts such as corn and rice. They contained less water, fat, and oil and gave complete saccharification in 48-50min.
CA, V. 51, 1957: 6938h

AKINRELE, I.A.; et al.

The manufacture of gari from cassava. Res. Rep. Federal Inst. Industr. Res., Fed. Nigeria 1962, 12, 1-8.

Cassava is generally made into a product known in Nigeria as "gari". which is produced by fermenting grated cassava tubers, semi. dextrinizing the mash by heat and finally drying this to a type of meal. The mechanization of the unhygienic village process is successfully being studied by the Federal Institute of Industrial Research. The initial experimentation was carried out by the former Director E.J. Jefferies, afterwards developed by the present Director A.S. Cook and the FAO specialist G. Baümer. A detailed description of the process is given. A method of peeling the outer skin of the tubers was evolved by tumbling them together in water so that the skin rubbed off mutual contact. The pilot plant of the mechanized process produced 1 ton of gari per day, and the product has been found satisfactory from a hygienic and storage viewpoint.
Royal Tropical Institute, Amsterdam, k 1132.

ANONYMOUS

Machine for processing cassava into gari developed in Nigeria. World Crops 1971, 23(4), 224.

Prototype gari cassava product processing plant installed in Nigeria.
Royal Tropical Institute, Amsterdam, vv535

BANKS, L.; COOK, A.S.

Estimates for a factory producing 10 tons a day of gari. Res. Rep. Federal Inst. Industr. Res., Fed. Nigeria, Techn. Mem. 1962, 14, 1-11.

With the growing urbanization and industrialization of Nigeria and the gradual increase in purchasing power there will be a need of mechanized production of gari to replace the village process. Mechanization will primarily allow control of the standard production of high quality material under hygienic conditions, and secondly fortify this low nutritional food with a protein additive. Detailed estimates are given for a factory of 10 tons of gari per day, based on the results of the pilot plant, described in the Research Report of the Federal Institute of Industrial Research No.13, 1962. The viability of such a factory directly depends on the price of the cassava roots, including transportation to the factory. Drawings. Tables. 2 refs.
Royal Tropical Institute, Amsterdam, k1134.

BAUMER, G.W.A.
Report to the government of Nigeria on the processing of gari and tapioca in rural industries. Expanded Techn. Assistance Progr. FAO Rep. 1962, 1486, 1-18; received 1964.

To make the processing of cassava into gari more profitable in Nigeria, where the traditional methods are very primitive, a pilot plant for mechanized processing was established and tested. The author assisted in increasing the low capacity of this plant, peeling of the roots has been mechanized; pressing of the fermented material and the frying and drying process were modernized. Processing in a 10-ton plant is described in detail; the cost price of gari is calculated and suggestions for the commercial processing of cassava are presented. The possibilities for a mechanized tapioca production for export purposes are favourable, though the yield and the starch content in Nigeria are still too low and transportation facilities should be improved. Appendices. Tables. 2 refs.
Royal Tropical Institute, Amsterdam, m1379.

BROOK, E.J.; STANTON, W.R.; et al.
Fermentation methods for protein enrichment of cassava. (Trop. Prod. Inst., London, Engl.). Biotechnol. Bioeng. 1969, 11(6), 1271-84 (Eng).

Two methods for nutritionally upgrading cassava were investigated; a direct solid-substrate fermentation and a liq. fermentation with starch-degrading fungi from which the fungal biomass was recovered. Prepn. of the flour and paste, including the complete medium, is given. The expts. reported were conducted with Rhizopus oligosporus and R. stolonifer. The moist paste is fermented as a spaghettilike extrusion to form a vegetable cheese in which the strands are bound together and permeated by threads of mycelium. The effect of addn. of various additives on the protein-N content of the solid fermentation is tabulated. The cheese process in particular commends itself to establishment as a village industry. Problems in introducing the product as a food are still to be worked out.
CA, V. 72, 1970: 65518f

CEDILLO, V.G.
Cassava rice, or landang. Philippine Agr. 1952, 35(8), 434, 440.

The author describes two methods of preparing cassava rice. The product is easy to process, keeps long and is an important substitute for rice and corn. Landang prepared according to the grater method contains 2.41% proteins and only 1.22%, using the soaking method.
Royal Tropical Institute, Amsterdam, a2425.

COURSEY, D.G.
(Trop. Prod. Inst. Overseas Development Adm., 56/62 Gray's Inn Road, London WC1X 8LU, U.K.). Cassava as food: toxicity and technology. IRDC Monogr. 010e, 1973, 27-36. H 1669.

The toxicity of cassava is caused by linamarin and lotaustralin, which can liberate HCN under the influence of linamarase. Cyanide levels cannot be related to formal botanical taxa. An important element in cassava processing is an attempt to reduce the cyanide content by solu-

tion in water or by volatilization, such as maceration, soaking, boiling, roasting, or fermentation of the cassava roots. There are often substantial residual quantities which may well be sufficient to produce chronic toxic sumptoms. Little reliable information is available as to whether linamarin itself constitutes a toxic factor, or whether toxicity only arises from hydrolysis of this compound to free cyanide. French summary. Tables. Graph. 60 refs.
Royal Tropical Institute, Amsterdam, x669.

FAVIER, J.C.; CHEVASSUS, A.S.; et al.
Traditional technology of cassava in Cameroun. Effect on the nutritive value. (Sect. Nutr., ORSTOM, Yaounde, Cameroons). Ann. Nutr. Aliment. 1971, 25(1), 1-59 (Fr).

Processes are described by which Manihot esculenta tubers are prepd. for human consumption; extensive tables list the nutrient compn. of each product.
CA, V. 74, 1971: 139676w

GIETEMA-GROENENDIJK, E.
Bereiding van cassave (Processing of cassava). Wageningen (The Netherlands), Agromisa, 1970. VI, 108 p. Tables. Fig. Many refs.

This book is a review concerning the processing of cassava. A brief discussion on the different aspects of cassava cultivation followed by chapters on: (a) cassava as foodstuff; (b) methods of processing in America, Africa and Asia. and (c) processes used in the manufacture of the different cassava-products. The book is concluded by a discussion and a conclusion.
Royal Tropical Institute, Amsterdam, u1863.

GOVEA, VERA de S
Production of Mandioca alcohol by continuous fermentation. (Div. Acucar Ferment., Inst. Nac. Tecnol., Rio de Janeiro, Brazil). Rev. Latinoamer. Microbiol. 1973, 15 (3), 147-50(Port).

Slurries of cassava meal were saccharifield by the action of amylase from Bacillus subtilis and amyloglucosidase from Aspergillus awamori. The resulting glucose medium was fermented continuously on a semi-industrial scale using Saccharomyces cerevisiae without addn. of artificial nutrients. A 90.8% yield was obtained in the conversion of glucose to EtOH.
CA, V. 81, 1974: 103184q

GRACE, M.
Processing of cassava. Rome (Italy), Food and Agriculture Organization of the United Nations, Agricultural Services Division. Agricultural Services Bulletin 1971, IX(8), 124 p. Appendixes. Tables. Graph. Figs. Photos. Refs. K 1912.

This bulletin is a completely revised edition of the one titled "Processing of cassava and cassava products in rural industries". New chapters were added on the utilization of cassava products, quality and quality control, world production and trade of cassava products, previous studies undertaken by FAO in various countries and the develop-

ment of cassava processing as well as the future of the cassava industry. The chapters on the cultivation of cassava crop and the manufacture of its products were enlarged and brought up to date.
Royal Tropical Institute, Amsterdam, v3061.

HOLLEMAN, L.W.J.; ATEN, A.
Processing of cassava products in rural industries. FAO Development Paper No. 54. Rome, 1956. X + 115 p. III.

Although this paper bears the character of a publication and thus actually falls outside the scope of the writings usually reviewed in this section, it is nevertheless well worthy of mention, as it provides the reader with a most interesting review of various aspects of the cassava industry: cultivation, processing methods and products. It is a genuine handbook on a small scale and, as far as we are aware, this comprehensive subject has never previously summarized in a like manner.
Royal Tropical Institute, Amsterdam, e1058

JARMAI, S.
A new fast method for the production of kokonte. Ghana J. Agr. Sci. 1968, 1(1), 59-63.

Traditional methods of producing kokonte in Ghana from cassava (Manihot utilissima Pohl) are described. It has been shown that a drying period of 5 days is sufficient to achieve the acidity of 0.25-0.60 % (expressed in lactic acid) required, even when traditional procedure is used. Investigatory experiments undertaken to work out a suitable technology for the industrial production of this fermented and cooked dish showed that a period of about 24 hours is sufficient to achieve a satisfactory degree of fermentation and a desirable taste. A total acidity (expressed in lactic acid) of 0.30-0.50 % should be maintained and a fermentation time of 20-24 hours is required. Results of organoleptic tests on laboratory-prepared kokonte are given and an outline for the establishment of an industrial pilot plant is presented. Author's summary. Figs. 3 refs.
Royal Tropical Institute, Amsterdam, r2330.

LACZYNSKI, B.
Technology of alcohol production from tapioca. (Warsaw, Pol.). Przem. Ferment. Rolny 1975, 19 (10), 23-5 (Pol).

An app. and a process of prodn. of alc. [64-17-5] from tapioca is described; 26.3 l. alc. were obtained in lab from 100 kg tapioca.
CA, V. 84, 1976: 87903c

MUTTA, K.; TANAKA, S.
Amylo process III. J. Agr. Chem. Soc. Japan 1936, 12, 129-38; of. C.A. 28, 2459^3

Rhizopus peka I and the 2 other species were proved to be best for alc. fermentation by the maylo process on a small industrial scale. The optimum concn. of the wort was 12-13% for kaoliang, 12-15% for dry sweet potato and 16-17% for cassava. The boiling of these materials was favorable under 2.5. atm. pressure for 30 min. The fermentation ratio by these materials was inferior to that of rice.
CA, V. 30, 1936: 6503^6

ONO, H.; DAZAL, H.

Production of alcohol from cassava by the amylo process. Rept. Fermentation Research Inst. 1953, 8, 56-9.

Cassava contained 82-3% total sugar and 0.3% total N. The amt. of N present is insufficient for the amylo process. The growth of amylo mold was inferior in the mash with cassava (I) than that with sweet potatoes (II), and the saccharification value of I was about a half that of II. Fermentation efficiency of 80% and sugar consumption of 87% were obtained with I. When the concn. of N had risen to about 80mg./100cc. by mixing 30% of corn, the saccharification rate was twice as great as that with II, and fermentation efficiency of 86% and sugar consumption of 93% were obtained.
CA, V. 50, 1956: 1256g

REYNVAAN, J.

Cassave producten. (Cassava produsts). Landb. Nieuws Suriname, 1954. July, 4,7.

Description of the processing of a number of cassava products in Suriname, especially that of bitter cassava, cassava bread, "kwak" or "koeak", kokori, kasiri and tapana (both alcoholic drinks). When preparing cassava bread, the juice containing prussic acid is removed during pressing. III.
Royal Tropical Institute, Amsterdam, b2330

TUONG, N.D.

Conditions for the saccharification and fermentation of cassava mash. (Kiev. Tekhnol. Inst. Pishch. Prom., Kiev, USSR). Fermen. Spirt. Prom. 1972, (1), 17-21 (Russ).

EtOH (I) yield was increased when starch from cassava was saccharified for 5 min by Aspergillus oryzae. Excessive saccharification (60 min), caused the deactivation of the enzymes. The addn. of more than 1 mold, e.g. A. oryzae plus A. awamori, increased the I amt., because of the increase of glucoamylase level in the wort.
CA, V. 76, 1972: 139002q

YAROVENKO, V.L.

Continuous production of alcohol from starch raw material. Nepreryvnoe Brozhenie i Vyrashchivanie Mikroorganizmov, Materialy Soveshchaniya Provedennogo Inst. Mikrobiol. Akad. Nauk S.S.S.R. 1958, 40-8 (Pub. 1960).

Continuous production of alc. from starch raw material proceeds much slower than from sugar solns. and is much less resistant to infection. The displacement of fermenting liquid in batteries of 2-10 tanks of equal vol. was investigated. The battery was filled with H_2O and then with sugar soln. The sugar content was detd. in each tank after addn. of a vol. of soln. equal to the vol. of 1 tank. After the 1st charge, only 70.9% of the sugar soln. remained in 1st tank complete displacement of H_2O in the 1st tank required 6-8 charges, and in the 5th tank 12 charges were necessary. Changes of tank shape, concn. of sugar (from 3 to 25%), or liquid velocity (from 0.06 to 0.49 l./sec.) did not effect the displacement of liquid in the tanks. Under such conditions,

the liquid from starchy raw materials contg. solid particles became contaminated and showed increased acidity. Frequent sterilization of the tanks and yeast washing with antiseptics is recommended.
CA, V. 55, 1961: 23920i

b. Microorganism

DWIDJOSEPUTRO, D.
Microbiological studies of Indonesian ragi.

The Indonesian word "ragi" is popularly used as equivalent to the English word "yeast," particularly with respect to its function as an ingredient essential for the preparation of certain fermented foods. Microbiologically speaking, however, "ragi" has a broader meaning than is conveyed by the word "yeast." It consists of yeasts and yeast-like organisms or of filamentous fungi, by the use of which a number of types of foodstuffs are manufactured. These include "roti" (bread), "tape" (a weak alcoholic condiment made from glutinous rice or from cassava), "tempe" (a condiment made from soybean or from peanut press cake), "arak" (an alcoholic beverage made from cereals or from palm sap), "ketjap" (soy sauce) and "ontjom" (a condiment prepared from the press cake of peanut) Samples of various "ragis" had been obtained from Malang (East Java), Surakarta (Central Java), and Djakarta (West Java), and their flora of yeasts and filamentous fungi has been studied with the aim of determining which micro-organisms are essential in the manufacture of the various fermented foods. Considering the way the various "ragis" are handled by the natives, it is not surprising that "ragi" proves to be a mixed population, including contaminants. This study has established the following essential constituents. From the baker's yeast preparation from Malang: Saccharomyces cerevisiae Hansen, and Candida solani Lodder and Kreger-van Rij. From the "ragi-tape" from Malang: Candida parapsilosis (Ashf.) Langeron and Talice, C. Melinii Diddens and Lodder, Hansenula subpelliculosa Bedford, H.Anomala (Hansen) Sydow, H. malanga nov. sp., and Aspergillus oryzae (Ahlburg) Cohn. From the "ragi-tempe" from Malang: Rhizopus oryzae Went and Prinsen Geerligs, R. arrhizus Fischer, Aspergillus oryzae (Ahlburg) Cohn, and A. flavus Link. From the baker's yeast preparation from Surakarta: Saccharomyces cerevisiae Hansen. From the "ragi-tape" from Surakarta: Candida lactosa nov. sp., and Chlamydomucor oryzae Went and Prinsen Geerligs. From the "ragi-tempe" from Surakarta: Rhizopus oryzae Went and Prinsen Geerligs, and R. stolonifer Ehrenberg. From the "tempe" from Djakarta: Trichosporon pullulans (Lindner) Diddens and Lodder, and Mucor javanicus Wehmer. Established as contaminants are Clindrocephalum sp., isolated from the baker's yeast preparation from Malang, and Fusarium oxysporum Wollenweber, isolated from "tempe" from Djakarta. The status of Aspergillus niger van Tieghem in "tempe" from Djakarta is not clear. In the course of this study two new species were described: Hansenula malanga nov. sp., isolated from "ragi-tape" from Malang, and candida lactosa nov. sp., isolated from "ragi-tape" obtained from Surakarta.
Author.

SAONO, S.; GANDJAR, I.; et al.

Mycoflora of "ragi" and some other traditional fermented foods of Indonesia. Annal. Bogor. 5 (4), 1974: 187-204.

Studies have been conducted on the mycoflora of samples of "ragi" and some fermented foods such as fermented cassava, fermented sticky rice and fermented peanut presscake. Yeast species of candida were found in both "ragi" and all the fermented foods investigated. The presence of Fusarium was noted only in "ragi", while species of Mucor were isolated from cell samples studied. Mucor Phizopus was present in almost all samples except those of block fermented peanut presscake.
Author.

c. Fermentation Studies

AKINRELE, I.A.

Further studies on the fermentation of cassava. Res. Rep. Fed. Inst. Industr. Res., Fed Nigeria 1963, 20, 1-13.

A description is presented of experimental work on the fermentation of cassava in Nigeria. A satisfactory product has been made by inoculating fresh cassava pulp with fermented cassava juice, leaving the mixture for a period of less than 15 hours at a temperature of around 35°C. Sunlight and frequent mixing of the pulp accelerated the fermentation; exposure to air and contact with iron result in discolouration of the product and should therefore be avoided. Tables. Graphs. 6 refs.
Royal Tropical Institute, Amsterdam, m1609.

ANONYMOUS

Fermentation methods with cassava to improve its nutritional value. Rep. Trop. Prod. Inst. 1968, 1967, 10-12.

Two methods of enrichment and production of protein from cassava. both based on the development of microbiological protein using added cheap mineral supplements, are described. The 1st method, the so-called TPI vegetable cheese process, consists of fermentation of a cake of extruded cassava dough mixed with salts and inoculated with spores of Rhizopus stolonifer. The other method subjects the carbohydrate containing material to an aerobic deep-culture fermentation, and recovers subsequently the microbial bio-mass from the fermented liquor. The work on the improvement of the nutritional value of cassava continnued.
Royal Tropical Institute, Amsterdam, r2555.

BANZON, J.

Fermentative utilization of cassava. Iowa State Coll. J. Sci. 1941, 16, 15-18; cf. C. A. 36. 1729^5

Cassava roots, the cheapest source of starch, were dried, transported from the Philippines and ground to a powder. The powder was analyzed for starch content and subjected to either alc. fermentation or butyl-acetonic fermentation. Acid saccharification produced glucose most effectively when the concn. of H_2SO_4 was 0.4 N, and the sample: acid: ratio was 1: 2.5 or 3. The pastes were too stiff for easy mashing and

gave a poor yield of EtOH. Saccharification was effected by mold-bran prepd. from wheat bran and a strain of Aspergillus oryzae. The mold-bran was merely added to the thinned paste at 30°. Increase of malt to 20% increased yields of EtOH to a max. of 70% of theoretical. Butyl-acetonic fermentation of cassava alone gave poor results, but as much as 80% of corn could be replaced by cassava without decrease in yield of total solvents. Shrimp powder, corn gluten meal and soybean flour could be substituted for corn. About 5% of each was required for undiminished production of total solvents.
CA, V. 36, 1942: 1729^6

BANZON, J.; FULMER, E.I.; et al.
Fermentation utilization of cassava. The butyl-acetonic fermentation. Proc. Iowa Acad. Sci. 1941, 48, 233-6.

The exptl. results showed clearly that cassava alone gave poor yields of solvents when fermented with Clostridium acetobutylicum. However, as much as 80% of the corn could be replaced by the ground cassava and still yields of solvents were obtained which were as good as from corn alone. The addn. of small quantities of shrimp powder, corn-gluten meal, and soybean flour was found to increase the amt. of total solvents to values comparable to those from corn. The optimum proportions of these materials was approx. 5% of the wt. of the cassava used. Compressed yeast and urea were not found suitable as nutrient sources. Peptone was excellent but its cost would be prohibitive on the industrial scale. So far as is known shrimp powder has not been used previously in fermentations as a source of nutrients. The use of shrimp powder was considered especially promising because of its ready availability in the Philippines.
CA, V. 36, 1942: 4663^3

COIMBRA, A.L.; FERNANDES, N.B.; et al.
A process for fermentation of cassava in the laboratory. C.A.D. Fiaes, Marta Arruda, E.A. Pinto Brandao, and N. Svaiter. Quimica (Rio de Janeiro) 1947, 3, 47-56.

A mixt. of 2.33 g. of malt flour of known sugar value and 20.95 g. of peeled, rasped, and dried cassava root is saccharified as usual to obtain 1500 ml. of a 10.1-Balling wort. A sample is reserved for analysis, and triplicate aliquots of the wort are acidified with H_2SO_4 to pH 4.8 and fermented with yeast in closed vessels equipped to wash the CO_2 evolved in fermentation. The fermented wort is centrifuged and the alc. content detd. by refractometer. Results are calcd. to the moisture-free basis. Efficiency fermentation is 95%.
CA, V. 42, 1948: 9070i

COLLARD, P. ; LEVI, S.
A two stage fermentation of cassava. (Univ. Coll. Ibadanm Nigeria). Nature 1959, 183 (4661), 620-1.

In the production of gari (pearl tapioca), the juice is pressed from the tubers of Manihot utilissima and the pulp is subjected to 72-96-hr. fermentation before roasting. In the first step of the fermentation starch is broken down to org. acids by the Corynebacterium manihot, discovered by the authors, and the toxic glucoside contained in

the tubers is broken down to HCN and glucose. This establishes favorable conditions for the 2nd stage of fermentation by the fungus, Geotrichum candida, which is responsible for the formation of a series of characteristic esters and aldehydes.
CA, V. 60, 1964: 3423d

HARRIS, R.V.
Effect of Rhizopus fermentation on the lipid composition of cassava flour. (Trop. Prod. Inst., London, Engl.). J. Sci. Food Agr. 1970, 21 (12), 626-7 (Eng).

Studies were made on the complex lipid and fatty acid compns. of com. cassava flour before and after nutritional upgrading with R. arrhizus. The flour lipids closely resemble those found in other plant tissues except for a lower content of polyunsatd. acids and a higher content of free fatty acid. This can be accounted for by degradation during processing. Rhizopus fermentation leads to the appearance of γ-linolenic acid and changes in the percentage of other acids. The total lipid content falls and the typical plant glycolipids disappear to be replaced by mold phospholipids. Sterol glycoside present in the original flour is not metabolized and becomes a major component of the final material.
CA, V. 75, 1971: 4239f

ROGERS, D.J.
(Dep. EPO Biol., Univ. Colorado, Boulder, Colorado 80302, U.S.A.). Some further considerations on the origin of Manihot esculenta Crantz. Trop. Root and Tuber Crops Newsletter 1972, 6, 4-10.

The botanical evidence is still too tenuous to provide exact data on the progenitors of, or points of origin of the cultigen, Manihot esculenta. In each area of cultivation, numerous wild species are found that can hybridize with local cultivars. The most closely related wild species is M. aesculifolia, which is widely distributed in Middle America, but other wild species are also closely related, and these are found in many regions of S. America. Too much emphasis has been placed on the differentiation between the sweet and bitter cultigens. Fermentation may play roles other than the ones which have been ascribed to it. 5 refs.
Royal Tropical Institute, Amsterdam, w2194

STANTON, W.R.; WALLBRIDGE, A.J.
Fermentation of cassava and other vegetable substances. Brit. 1,277, 002 (Cl. C 12d), 07 Jun 1972, Appl. 9940/68, 29 Feb 1968; 4 pp.

The fermentation consists of a process in which a mucoraceous fungus of the genera Rhizopus, Mucor, or Aciinomucor or a fungus of the genus Monilia is fermented on a solid or paste-like substrate which is a mixt. of an edible protein-deficient vegetable material of the genus Manihot, esp. material known as cassava, of which the carbohydrate is mainly starch and a compd. contg. N in nonproteinaceous form and assimilable by the fungus to synthesize protein. Thus, tubers obtained from M. esculenta (M. utilissima) are peeled, dried, and ground to give a tapioca flour. The N source is prepd. by dissolving 45.8 g NH_4NO_3 and 8 g KH_2PO_4 in 200-300 ml distd. H_2O and to this is added inoculum, 15 ml of a spore suspension of R. stolonifer. The mixt. is stirred into

1 kg of milled cassava flour and 300 ml of H_2O is added, so that the final moisture level is 45 ± 3%. The pH is 5.4-6.7 and the mixt. is mixed with a machine for 10-12 min to give a stiff paste. The dough is extruted as a spaghetti 3-5 mm diam. and strands are cut into 10 cm lengths. The strands are packed into shallow fermentation trays, which are covered with a loose fitting Al lid and placed in the fermentor. Temp. is kept at 30° and relative humidity is kept at 95-7% for 72 hr. Fermentation is stopped by cooking or by deep freezing. The protein content is raised by the process from 0.2 to 4%. The initial toxicity of the cassava is also reduced.
CA, V. 77, 1972: 73698h

d. Nutritive Values

ANONYMOUS
Alcohol from the cassava plant. Perfumery and Essential Oil Rec. 1950, 41(1), 1.

De bereiding van alcohol uit cassavezetmeel blijkt rendabeler te zijn dan die uit gerst. De alcohol wordt voornamelijk uitgevoerd naar Zwitserland. Dit procede is beschreven door drie chemici van J.E. Seagram & Sons (Louisville) voor de Chemical Society.
Royal Tropical Institute, Amsterdam, 3024

EKANDEM, M.J.
Preparation of cassava in the human diet of Nigeria. Mem. Fed. Dep. Agr. Res. Moor Plantation, Fed. Nigeria 1961, 29, 1-9.

Preparation and consumption of gari, fufu (or foofoo), cassava flour and boiled cassava. Cassava will continue to increase in importance as a food product in Nigeria. Photos. 5 refs.
Koninklijk Instituut voor de Tropen.

JOSEPH, R.; RAO, T.N. R.
Glutamic acid fermentation employing starchy tubers as raw materials. (Cent. Food Technol. Res. Inst., Mysore, India). J. Food Sci. Technol. 1973, 10(4), 160-4 (Eng).

Glutamic acid (10.75 mg/ml) was obtained by culturing Micrococcus glutamicus on a 200 ml medium contg. potato hydrolyzate (5% total sol. solids), urea 0.3, peptone 0.2 meat ext. 0.2, K_2HPO_4 0.2, and KH_2PO_4 0.2% for 72 hr at 28-30°; potatoes were steamed for 25-30 min, washed, and hydrolyzed with amyloglucosidase for 24 hr at 55° and the excess biotin in the potato hydrolyzate removed by adsorption on activated C prior to fermn.
CA, V. 80, 1974: 144373y

MARTINO, G.; CHENU-BORDON, J.C.
The alimentary value of manihot. Boll. soc. ital. biol. sper. 1932, 7, 756-9.
CA, V. 27, 1933: 349^7

OKE, O.L.

Chemical studies on some Nigerian foodstuffs "Gari". Nature 1966, 212 (5066), 1055-6.

Gari, an important foodstuff in Nigeria, is prepared by grating peeled cassava roots, fermenting for 4 days in sacks weighted with stones, drying, and frying. Chemical analyses of cassava tubers and gari showed that during fermentation, in which a bacterium and a fungus play a role, a large part of the protein is lost so that gari contains only 0.9% protein. Moreover, the ash content of gari is only about 50 % of that of fresh roots. Gari contains only 0.2-0.3 % oxalate but this may still make part of the calcium unavailable. The HCN content is reduced to a low level during fermentation and still more during frying. Prospects of commercial gari production are good now that a mechanized method of preparation has been worked out. Enrichment with protein to improve the value of gari as a foodstuff is being considered. Tables. 7 refs.
Royal Tropical Institute, Amsterdam, q333

OKEZIE, B.O.

Improved food uses of cassava (Manihot utilissima Pohl): advances in research. 36/04 p 1637B.

A proteinized (Super) gari made by combining freshly ground cassava tuber with soy protein contentrate and acid whey powder (CSW) was developed. It received good scores on various quality attributes by a taste panel and had a P.E.R. of 2.1. Its biological quality was considerably improved by low level methionine supplementation giving a protein efficiency ratio of over 2.4 almost equal to the protein efficiency ratio of the reference standard casein product. A similar proteinized gari with single cell protein (SCP) from Candida tropicalis and acid whey powder (CSCPW) did not prove as acceptable and as biologically available as the CSW.
The products showed good stability for 16 weeks under a storage condition simulating a tropical environment of high temperature, high humidity in a standard package of aluminium-polyethylene-cellophane lining sealed either with air or under vacuum.
Sacharification of the cassava starch was successfully carried out with 0.1N HCl at 121°C for 1 hr.
Candida tropicalis and C. utilis were cultivated by batch using the cassava hydrolysates. Single cell protein (SCP) with total protein content of about 51% and 48%, respectively, and of comparatively good protein score, low nucleic acid content and good amino acid profile was produced with the two Candida yeast strains. The proteins were rich in lysine and many other essential amino acids except methionine and tryptophan which were the limiting amino acids.

The yeast proteins were extracted with sodium hydroxide and precipitated at their isolectric point (pH 4.0-4.5) with hydrochloric acid. The estracted proteins as contentrates had good amino acid profile with
Dissertation Abstracts International: B 36, 1975, 4: 1637

SOEDARSONO, J.; HARTIADI, S.

Bahan makanan protein: tape. (Protein foodstuff; tape). Science meeting on food proteins and soybean sauce processing, 1-2 June 1972, Lembaga Kimia Nasional -LIPI.

Tape is made of fermented cassava. So it is alcohol containing food with a sweet and slightly acid taste. The taste variation depends on the "yeast" used for fermentation.
Author

TEIXEIRA, C. a.o.
Ethyl alcohol from cassava. Industr. Eng. Chem. 1950, 42(9), 1781-83.

De aethylalcoholbereiding uit cassavechips („gaplek"), die tot dusver geremd werd door het ontbreken van een juiste methode van vergisting. In Brazilië wordt hiervoor mout van maïs gebruikt, dat echter onvoldoende versuikert. Bewaren van de andere vergistingsstoffen. Bij recente onderzoekingen bleek een efficiënter vergisting te worden bereikt met schimmel enzym-preparaten en wel van een bepaalde Aspergillus nigerstam, gekweekt op een voedingsbodem van gedroogde destilleerafval, maismeel en calciumcarbonaat. Bij deze methode werd een omzetting van 90 % verkregen (tegen 70-80 % bij andere vergistingen). Waarschijnlijk kunnen ook andere bestanddelen worden gebruikt voor de schimmelcultuur, o.a. spoeling van cassave-of rijstmeel. Lit. Zie ook pa 1783/1789, S.C. Pan a.o., Rate of secondary fermentation of corn mashers converted by A. niger.
Royal Tropical Institute, Amsterdam, 3988

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